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NOTES.

Fruit Cases.—It is gratifying to notice that the late conference at Hobart has come to a general agreement on a standard, viz., of fruit cases to be used. The present want of such a system is an intolerable tax and wrong to both grower, agent, and purchaser.

A Big Undertaking —Something very fortunate for several regions of the State of California lies in the fact that the U.S. Department of Agriculture will undertake to lay out a general drainage system for portions of Fresno county which are suffering from rise of alkali. Already an experiment has been laid out to demonstrate the feasibility of washing out the alkali, and the other work is supplementary thereto in that it shows how the water can be disposed of when it has become loaded with alkali. This work will be prosecuted by the irrigation corps of the department, under direction of Prof. Elwood Mead, and will be entrusted probably to Prof. J. M. Wilson, who is the local agent and expert for California.

Ladybugs from China to Fight the Scale.—Washington, May 3.—The Department of Agriculture is preparing to fight the ravages of the San José scale throughout the country with its natural enemy, the ladybug, brought from the interior of China. Assistant Botanist Marlatt has just returned from the Orient, where he sought the original home of the dreaded scale. Far in the interior of the Flowery Kingdom, where European plants had not penetrated, he found the scales, and also the ladybugs, which kept the scales in subjugation and permitted the native plants to flourish. Mr. Marlatt started home with a good supply of these ladybugs, but only sixteen survived on arrival in this country, and fourteen of these subsequently died. The two remaining, however, were nursed carefully by the Government with a view to fighting the scale in the same manner as in China. There are now fifty of them, requiring the constant gathering of scales from the department grounds for food. While not expecting the scales to be exterminated in this country, experts are planning to attack them with the increasing breed of their natural enemies.

Planting Maize.—Experiments have been conducted to test how far the yield of maize was influenced by early and late sowing. All other conditions being favourable, a wide range in the time of sowing can safely be relied upon for success with this crop. Sometimes seed sown in September gives the best results, while again seed sown as late as Christmas will produce the best crop. The results depend entirely on the season. Maize does not like a check in growth either from excessive moisture or severe drought, the critical period being when it is tasselling. The seed should be properly selected, and soaked in a solution of copper (say, 1lb. of bluestone to ten gallons of water) to destroy the spores of

smut and to deter birds and animals from tearing up the seed. Land intended for maize should be deeply ploughed, say, from 7in. to 9in., according to the nature of the soil. A perfect tilth must be obtained by harrowing, scarifying, discing, or rolling. The better the tilth the greater will be the returns. Maize roots penetrate to a considerable depth, and a deep tilth should, therefore, be provided at any cost.

Abortion in Mares.—Some interesting investigations in regard to the question of epizootic abortion in mares have recently been made at the veterinary college at Berlin. As a result of these investigations, it was found that epizootic abortion in mares is caused by a bacillus, but that this is not the same as that which produces contagious abortion in cattle, the two being of quite distinct character. The bacilli which cause the disease in horses obtain an entrance into the uterus either through the vagina or by means of the blood system, as a result of which abortion takes place in the case of pregnant mares. The cause of the disease is very readily spread, and, therefore, contagious. Infected mares help to spread it by the bacillus being found on the prematurely-expelled fœtus, the fœtal membranes, and also in the secretions from the vagina. Experiments which were conducted in order to prove whether the bacilli-producing epizootic abortion in mares would have the same effect when pregnant cows are inoculated with them, showed that the latter are not affected by them, and abortion did not result in their case. Rabbits, mice, and guinea pigs were also inoculated, but it had no effect on them in any way.

Peruvian or Cuzco Maize.—Steps were taken last season by the Department of Agriculture to import from Peru some of the large white maize, which yields such large grains, and is such a heavy yielder in South America. A quantity was ordered for last season, but it arrived too late to be of any use. The seed has been kept until the present time, and is now available for distribution. In connection with this seed the following cutting may be of interest:—"Secretary James A. Filcher, of the State Board of Trade, has brought with him from Philadelphia a jar of Peruvian orn, the grains of prodigious size being white and shining, resembling nothing so much as horses' teeth. Unlike ordinary maize, they are not solid, but are composed of a thin, brittle shell, filled with a white flour, which seems to be a cornstarch of Nature's fabrication. This wonderful plant grows from 20 to 28 feet in height in Peru, bearing two to three ears to a stalk, each of them from 18 to 20 inches in length and 3 to 4 inches in diameter. This Peruvian corn was first brought to the attention of growers in this country by the Philadelphia Commercial Museum, which placed some on exhibition two years ago, creating quite an excitement among Eastern agriculturists, who believed they had found something that would yield them a fortune. Repeated trials proved, however, that the plant would not mature during the short Eastern season. It is said to require not less than seven months

for growth and ripening. Seeing it on exhibition by the Peruvian Government at Buffalo, Mr. Filcher succeeded in obtaining about a quart of the seed, which he is desirous of distributing among California farmers who have good corn land, and who will promise to plant the grains early and give them the best possible conditions for growth. He desires in return only a few choice stalks for exhibition at the Board of Trade rooms in the ferry building and at the Louisiana Purchase Exposition, which is to open in St. Louis in 1903. A practical farmer himself, well acquainted with California's capacity for assimilating foreign products, Mr. Filcher believes that the corn will grow in California, and fully expects to have it attain a height of 30 feet under her friendly skies."

Control of Sex.—The control of sex in cattle-breeding is a subject to which breeders generally ought to give close and reflective study. A writer in the *Farmer and Stockbreeder* says:—"I have no desire to appear in borrowed plumes as the originator of it. From my earliest recollection it has been a cardinal belief with north-country farmers—'If you want heifer calves, use an old bull on young robust cows.' This I heard from a relative sixty years ago, and from this I made the deductions contained in my letter. But it must not be lost sight of that there is no rule without its exception, and, as I pointed out, there may exist certain conditions of health, ill-health, over-service, or other conditions not apparent on the surface, which may prove the exception to the rule, and thus apparently prove subversive of the rule. But such exceptions do not go to prove that the rule (or theory even) that the prepotency of the parent at the time of copulation rules the sex is fallacious or built on a wrong foundation. All that I claimed was that by attention to age and robustness in the mating of animals, not overlooking the fact that females, as in the human race, age and lose robustness and vigour earlier than do males, we may, to a considerable extent, control the sex of our animals. It has been suggested by one writer to the discussion that the equalisation of the sexes is a Divine ordinance for the perpetuation and equalisation of the species. If he confines this to the human race I do not care to argue the point with him, as in the present category we are discussing the control of sex in animals, as it appears to me that he has quite overlooked a very essential and material point. Somewhat singularly, as a coincidence, I am sending you by the same post a note of six births in a Shorthorn herd I visited to-day, of which five are bull calves to one heifer. On comparing the ages in the catalogue of the herd I find that the sire of the bull calves is a healthy, vigorous, and robust four-year-old, while the dams are all his seniors; had these dams been served by an aged bull, a yearling, or two-year-old bull, I should have expected a majority at least of heifer calves. The sire of the heifer calf is in his sixth year, and the dam four years old. As straws on a stream indicate the course of the current, so this at least adds confirmation to my theory on the control of sex."

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

By Robert Hall.

Painted Quail.

Turnix varia, Lath. (*Tur'niks va'ri-a*).

Turnix, a genus of Hemipodes (*i.e.*, one or more toes absent; half-footed), from *coturnix*, a quail; *varius*, spotted.

Hemipodius varius, Gould, "Birds of Australia," fol., vol. v., pl. 82; "Key to Birds of Australia," Hall, p. 75 (1899).

Geographical Distribution.—Areas 9, 6, 5, 4, 3, 2.

Key to the Species—

Adult male has chest buff, irregularly spotted and marked with grey; no rufous nuchal collar, but otherwise the upper surface similar to that of adult female.

Adult female has chest grey, each feather with a pale buff or whitish shaft streak, becoming more or less spatulate towards the margin; feathers surrounding eye black, spotted with white; has a fairly defined bright rufous nuchal collar, each feather narrowly barred with rufous. Bill stouter than in male.

The quails of our Island-continent fall into two divisions, the True quails and the Button quails. With one exception the nine species of the latter are Hemipodes, or half-footed, *i.e.*, there is no hind toe. A noticeable feature, also, is that the former lays seven to ten eggs at a sitting, while the other lays four eggs. The Painted Quail is a Hemipode, and, as far as we are aware, it is the only example of the family along the whole Western side of the continent, excepting the extreme North of it. Along the Eastern border of our State other species will doubtless early be recorded. During a recent visit to the Houtman's Abrolhos I met with several specimens on the wing. One from these islands, handled by the writer, through the courtesy of the Curator of the Perth Museum, presented characters that differed slightly from those of the well-known form. It would be interesting to secure more skins. The habitat of this species is a varied one: coarsely grassed insular spots, stony country slightly wooded and grassed, or heavily timbered lands. It is a bird found all along the Southern and Eastern portions of Australia. Upon the ground it runs very quickly, and when flushed it does not rise to any great height, but rather flies close to the grass. As it runs the neck is stretched outwards, and the head is carried high.

Nest.—A loosely made bowl of grass placed in a slight depression; it is most often found beneath a tuft of grass.

Eggs.—Four to the sitting; shape, swollen oval; pale buff ground, with minute spots of reddish brown and brownish grey all over it. Length, 1 inch; breadth, 0·75 inch.

Brown Quail.

Synoecus Australis, Temm. (*Si-ne'kus*: *as-tra'lis*).

Sunoikos, living together; *Australis*, southern.

Synoicus Australis, Gould, "Birds of Australia," fol., vol. v., pl. 89, "Key to Birds of Australia," Hall, p. 73 (1899).

Geographical Distribution.—Areas, 9 to 1.

Key to the Species:—Bill short and stout, culmen arched, and overhanging the mandible; hind toe raised above the level of the others; nostrils exposed; axillaries short and grey.

Male:—Chin and throat dirty white; plumage of the back shows the shaft stripes to be narrower than in those of the female and confined to the shaft; upper parts not blotched with black or with the black markings present in the form of moderate bars; sides of crown not mostly black as in female.

Female.—Chest pale rufous buff, barred all over with black, sides of the crown black, or mostly black; upper parts coarsely blotched with black: shaft stripes wider than the shafts themselves.

There is a considerable difference in the markings of the Brown Quail, and many of the genus have lived a long time under different titles, as Sombre Swamp-Quail and Northern Swamp-Quail, each with its own classical name. They are now referable to the present form. It is distributed in coveys of 10 to 20 birds throughout Australia, occupying many natures of country: along rivers and marshes, or more commonly upon grassy plains. The power of flight is feeble, and a bird seldom flies more than a few yards near the ground, upon which it quickly alights.

This is after an active, burring flight.

It sits so close that one, unless accompanied by dogs, may pass within a yard of it before it will fly. "When hatching its eggs the long feathers on the side of the breast spread out at right angles from the body till the bird could hide an ordinary tea saucer."

The male appears to leave most of the work of incubation to the female, but helps the young to dainties with his beak, from which they take them.

The preservation of Quail in standing crops, and in fact upon all land that is being tilled, is very important to the lessee of such property. It is a mistake to be always considering quail from the sportsman's point of view. Such birds are a luxury in a country where most of its land is being cultivated. In our State there is no present demand for full legal cover, but it is certainly unwise for anyone to shoot quail, or allow others to do so, upon or near their Christmas holidays. Just try to imagine the value of such a ground bird when we hear that 1,200 wire worms were recently taken from a quail-pheasant, while another was found to have in its stomach 440 grubs of the crane fly, so destructive to grass land.

In "Insect Life" for 1892 a record is made: "One crop showed 101 potato bugs as the little fellow's breakfast, for the bugs were yet alive and began to move about when brought to the fresh air."

Nest.—Similar to the preceding one.

Eggs.—Eight to 15 for a sitting. Minutely freckled with buff over a white very faintly tinted with blue, or a uniform bluish or dirty white without spots.

Length, 1·2 inches; breadth, 1 inch.

Grass-Bird.

(*Little Grass-Bird*).

Megalurus gramineus, Gld. (*Meg-a-lu'rus gra-min'e-us.*)

Megas, great; *oura*, tail; *gramineus*, pertaining to the grass.

Sphenœacus gramineus, Gould, "Birds of Australia," fol., vol. iii., pl. 36; "Key to Birds of Australia," p. 24 (1899).

Geographical Distribution.—Areas, 9, 7, 6, 4, 3.

Key to the Species.—General appearance, brown; fore-neck and lower throat more or less clearly streaked with dark brown; secondaries black, edged with buff; tail feathers, graduated; tail, 2·5 inches, and longer than wing. Total length, 5·75 inches.

Never look for this species by the road side or upon trees. You will seldom if ever find it. Try a swamp, and take off your unmentionables, as you will need to look well and perseveringly. Still, the Grass-bird is not uncommon among the water rushes. Although well-dispersed in our continent, it appears scanty in number because of its retiring disposition. Its habits are quite reserved, and its life is that of a recluse. Unless you go through the low scrub or rank swamp grass, and actually force them to rise and fly a few yards beyond, you will not see any. I have waded into creeks and explored for many of their nests, yet I have never seen a bird except under those circumstances. In fact, it was years before I traced correctly the weird call of the little bird. Sportsmen who hunt lagoons, and cow-lassies who bring in their kine from them, hear the uncanny monotone of some little animal in the distance. Of course the lassies know all about it, but very few others do. To further demonstrate the quiet life of the species, I have examined thousands of birds' eggs in boys' collections, and on one or two occasions only have I met with the eggs of this bird. I use the present opportunity to tell the boys it is a barbarous habit to take birds' eggs unless they are collecting for the local museum. Such there should be in every hamlet, in order that one may know the animals and plants, useful or noxious, of the district.

The name "Stench-bird" has been applied because of an offensive smell it is said to emit. Personally, my nose has not detected any objectionable aroma, but game dogs quickly trace the birds by this means.

Nest.—Suspended in rushes growing in water; domelike; entrance near top; deep; grasses, lined within by feathers.

Eggs.—Four to a sitting; ground colour flesh-white, minutely freckled with red, varying in intensity in different sets. Length (much longer than broad), 0·75 inch; breadth, 0·5 inch.

Bush-Lark.

(Thick-billed Lark.)

Mirafra horsfieldi, Gld. (*Mir-af′ra hors-field′i*).

Mirus, wonderful; *Africus*, Africa; *Horsfield*, a proper name.

Mirafra horsfieldii, Gould, "Birds of Australia," fol., vol. iii., pl. 77.
"Key to Birds of Australia." Hall, p. 52 (1899).

Geographical Distribution—Australia, except Tasmania.

Key to the Species.—General plumage, ashy brown; blackish centres to the grey feathers of head and back; bill, very strong and short; nostrils exposed, with a superior membrane; planta tarsi (sides and back of tarsus) scutellated.

Although in Australia we have birds with remarkable voices, such as the Lyre-bird, and Tooth-billed Bower-bird, we have but one or two that correctly sing in the night. This is the first, a second is the Reed Warbler, while the Black Fantail has a set bar of sweet notes which it little varies throughout the dark hours. Africa is the stronghold of this genus, and there it got the classical name. Since then it has ranked as an alauda, or great songstress.

Of birds that sing in the day our Song Larks are nearly as good. But it is at 10 p.m., in the quiet of a restful evening, that one listens from the home verandah to the sweetest carol in the air above an adjacent crop. It is not for everyone to hear this "noon of night" bird as it floats high in the moonlit air, gently breaking the quiet with a rich sweet voice. Still, I hope we may all have that pleasure in due course, as it is one of Australia's musical treats. Very few people realise that about half the birds they call common Ground-Larks are of this species. Both associate occasionally in the same field, and are then meadow birds. The Bush-Lark has a strong, finch-like bill, with a shorter body than the Pipit, and is just as widely distributed.

Nest.—In general aspect much like that of the Pipit, and placed in a slight depression in a paddock.

Eggs.—Three eggs to a sitting. Ground colour light brown, thickly sprinkled with fine spots of a darker brown. Length, 0·75 inch; breadth, 0·5 inch.

Grass-Warbler.

(Corn-Bird.)

Cisticola exilis, Vig. and Hors. (*Sis-tik′o-la ek″sil′is.*)

Cistus a rock rose; *colere*, to dwell; *exilis*, slender.

Cisticola exilis, Gould, "Birds of Australia," fol., vol. iii., pl. 42.

Geographical Distribution.—Areas 8, 6, 5, 4, 3, 2, 1.

Key to the Species—General description sandy buff, much striped; tail strongly graduated or rounded. Total length 4 inches.

Winter Plumage.—Male and female, blackish, with streaked head and back.

Summer Plumage.—Male, head, rufous. Female, head, striped.

To the present date this slender-bodied warbler has only been recorded in our State in the North-West portion. It is partial to a

rankly-grassed country and very shy. Creeping about and not showing itself when strangers are near, it has caused itself to be looked on as an uncommon form of feathered animal. In flight, it rises from the grass like a large brown butterfly, very slowly, and with a kind of flutter. At first sight it is very difficult to distinguish between bird and butterfly. Both rise from the tussocks, and when clear, flap along the plane of them for some time.

As soon as the bird gets to the horizon, the distinguishing difference is evident.

The calls of the male in the air are of two natures: one, a plaintively soft note; the second, a brisk whistle immediately following the first.

To find a nest in the corn or rank grass needs one's wits in the best of state. An examination of a dozen spots whence the birds rise may not in one instance reveal a nest. Even when the bird alights one would naturally suppose the nest in reason would be within a few paces. It is not so, for, mouse-like, it runs along the tussocky ground for a distance before reaching the nest. This, a friend and I tested after patient observation and search.

Like most birds, it is nomadic. How far south it travels is not yet known.

Nest.—Small, oblong or pyriform, and side-entranced; made of grass and other fine material, and suspended in coarse grasses, often in growing corn.

Eggs.—Three or four to a sitting; pale blue, spotted with reddish brown of varying intensity. Length, 0·6 inch; breadth, 0·5 inch.

Long-Billed Reed-Warbler.

Acrocephalus longirostris, Gld. (*Ak-ro-sef'a-lus lon-ji-ros'tris.*)

Akros (a reference to the bill of the bird), a pointer; *kephalos*, a head; *longus*, long; *rostrum*, beak.

Acrocephalus longirostris, Gould, "Birds of Australia," fol., vol. iii., pl. 38. "Key to Birds of Australia," Hall, p. 20 (1899).

Geographical Distribution.—Areas, 9, 8.

Key to the Species.—General colour of upper parts russet-brown; under surface deep fawn; third primary longest, second equal to or longer than sixth; spurious primary is so minute that it scarcely extends as far as primary coverts; bill typically large, depressed and broad at base, with moderately developed rictal bristles. Wing three inches in length; culmen, 0·8 inch; tail, 2·9 to 2·6 inches.

The earliest nature lover to record the present species was Mr. Gilbert, who observed it in the reed beds of the lakes and rivers around Perth. Mr. Gilbert writes:—"It sings both day and night, and its strain is more beautiful and melodious than that of any other Australian bird with which I am acquainted; being in many parts like to that of the far-famed nightingale of Europe. This species is found only in Western Australia, and I believe no other bird of our continent has yet been so lightly spoken of."

The Grass-Warbler *(Cisticola)* has a sweet voice and enjoyed when once heard in the heart of its haunts, in the North-West of our State, and in Eastern Australia.

The Reed-Warbler and Grass-Bird live peaceably together in the same reeds, though they are of opposite natures in many respects. The former whistles in the day, richly and harmoniously, just as it does in the night; builds an open nest, lays plain eggs, and lives in water reeds. The latter calls weirdly at night, and is quieter in the day, builds a side-entranced nest, lays brightly-coloured eggs, lives at times in reeds (generally when breeding), and in other months in the dry swampy bushes not directly in the creek, but in the winter overflow. The food of the Reed-Warbler is largely insects. Holders of river frontages benefit by the incursions of the young and old birds in search of provender. The young in the early phase assume the dress of the parents, which is not the rule with birds.

Nest of Reed Warbler.

Nest.—Placed in "sedgy" grasses in the water, attached to four or five stems; open, cup-shaped, deep, made of grasses and lined with finer grasses. The plate illustrates the shape and position.

Eggs.—Four to a clutch; ground colour dull greenish white, thickly blotched and spotted with umber and dense brown, as well as markings of a pale olive, appearing as if beneath the surface. Length, 0·75 inch; breadth, 0·5 inch.

BEE NOTES.

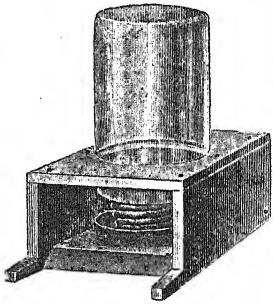
By J. Sutton.

Replying to several questions, and reference to my previous writings on bees and bee-keeping, which have appeared in this journal, I regret very much circumstances over which I had no control prevented my continuing them, but I hope in the near future to do so.

Healthy stocks, as a rule, require but little, if any, attention at the present time; indeed, providing they have plenty of stores, they should not be disturbed in any way. Be sure your hives are water-tight, as bees cannot live in a damp hive; indeed, such hives are an abomination, and don't reflect on the owner as a good bee man. More disease and trouble arise from this cause than almost any other.

I have never been troubled with any disease in my own apiary since I have had them in this State, and those I have to deal with were in each case the result of leaky and badly-made hives and boxes. If attention is given in the early stage, foul brood is very easily overcome, and may be done without the loss of any bees, providing there is a honey flow. Feeding with syrup may assist, but this is rather risky at best.

If any are in doubt as to whether the bees have plenty of stores, and a glance in front of any hive that is short of stores any cold morning many dead bees will be found. As soon as they get a little warmth such should have feed given, made warm, and with a Boardman feeder, as illustrated, placed in front of the hive any warm evening. This feed, or sugar syrup, should be thin, and given warm. Messrs. Sandover and Co. have this feeder in stock, and instructions given with it. Don't give it if the weather is cold and raw; after a warm and sunny day is best; and providing stocks are a little weak, trouble will follow, and spring dwindling may be the result. But feeding as above may avert this and help to build up and strengthen the colony.



There is another disease, almost twin brother to foul brood, what is termed pickled brood, but I have not heard of this trouble in this State yet, still it may have been looked upon and taken as foul, and, without proper attention is given at the right time, the results are quite as bad as the former. If any want directions, and will write me direct, giving symptoms, I will be glad to give any assistance in my power.

While the bees are not requiring attention, any spare time should be devoted in getting ready spare hives, frame, and sections, as swarming time at all times brings plenty to do, even with hives in readiness. In putting in foundation, both in frames and sections (and I strongly advise full sheets), it is well to see that your foundation is warmed and made nice and pliable. If this is neglected, your wax cracks here and there, resulting in holes in your frames, and perhaps you may wonder why.

The bee, or wax-moth, during last season in some districts were very bad, and until Italian queens are introduced this is sure to result, and will spread, getting into trees, only to be a nuisance to bee-keepers later. Better leave the persuit alone than continue with the black bees.

THE CULTIVATION OF SUGAR BEETS.

By Percy G. Wicken.

Numerous inquiries having recently been made by several agricultural societies and private individuals for information on this subject, the following brief notes may be of interest, in which I have endeavoured to set down the methods that are adopted for the purpose of growing a successful crop of beets and a few statistics and other information which may be of value to those interested in this subject:—

The beet belongs to the *Chenopodiaceæ* or *Salsolaceæ*, an order of plants which include among them many of the native saltbushes. The sugar beet (*Beta vulgaris crassa*) is supposed to have been developed from the wild beet (*Beta vulgaris maritima*), which is indigenous to the countries along the coast of Southern Europe. It is a biennial plant—that is, of two years' duration. The first year it produces a full-sized root, the second year it produces its seeds, and then dies off. Sometimes a few plants produce seed the first year, but this is only on account of the seed being of poor quality.

The conditions required for the successful cultivation of sugar beets are a deep, well-drained, loamy soil. A good chocolate soil, made from decomposed basalt, will produce good samples of sugar beet; a light subsoil is also desirable, so as to enable the superfluous water to drain away and the air to penetrate the soil. The climatic

conditions have a very important influence upon the value of the beet for sugar production. It requires a medium temperature ranging from 65° to 70° during the growing months, a rainy summer, and a fairly high altitude above sea level. Such land as is found in the Glen Innes and Armidale districts of the New England tableland in New South Wales and parts of Gippsland, in Victoria, being the most suitable spots. Such land, in fact, we have none of in this State. Most of our chocolate soils which might be suitable for the cultivation of sugar beet are too deficient in rainfall, and too hot during the summer months to produce a good crop; while on swamp land, on the coastal and S.W. districts, where the rainfall and moisture might be sufficient, are not adapted for the cultivation of this crop. To produce a beet suitable for the manufacture of sugar, the beets require to be of a small size, and contain a high percentage of sugar. Beets grown on our coastal lands would, no doubt, grow to a large size, and although suitable for feed for stock, would contain a very small percentage of sugar, and be useless to a sugar mill.

Preparation of the soil.—A commencement in the preparation of land intended for the cultivation of sugar beets should be made in the autumn. If good, clean, well-shaped roots are required, the plants must have a good depth of soil to grow in; nothing is so likely to cause forked roots as shallow cultivation. When the top root of the plant strikes a hard pan subsoil and finds it cannot get down any deeper, it immediately begins to send out side roots, and forked roots are the result. To overcome this, it is necessary to subsoil the land, and this can best be done by using two ploughs following one another, and the second plough having the mould board removed. The first plough turning a furrow as deep as it can, and the second plough breaking up the ground in the same furrow, but not bringing it to the surface. The subsoiling requires to be done to a depth of about 15 inches, and this will allow plenty of depth for the average size beet. The land should be left in this rough condition during the winter months, and in the early spring it should again be ploughed lightly, if necessary, and then worked up to a fine tilth by means of disc harrows, rollers, etc., so as to obtain a fine seed bed on the surface, and also a good depth of finely-worked soil.

Seed.—Care requires to be exercised in the selection of seed, and only those varieties giving the highest percentage of sugar should be selected. The varieties best known and mostly grown are the De Klein Wanzlebein and Vilmorins Improved, and the Department of Agriculture has secured a small supply of seed of these varieties, and they are now available for distribution on application. The best time for planting the seed is during the month of September. The seed is the same in appearance as that of the mangel wurzel, and it is hard to make any distinction between the two seeds. The smaller size seeds should be selected, as it has been proved in France that the large size seed yields a large root, and the smaller size seed a small root. The large roots are deficient in their percentage of sugar, and are not desirable to grow.

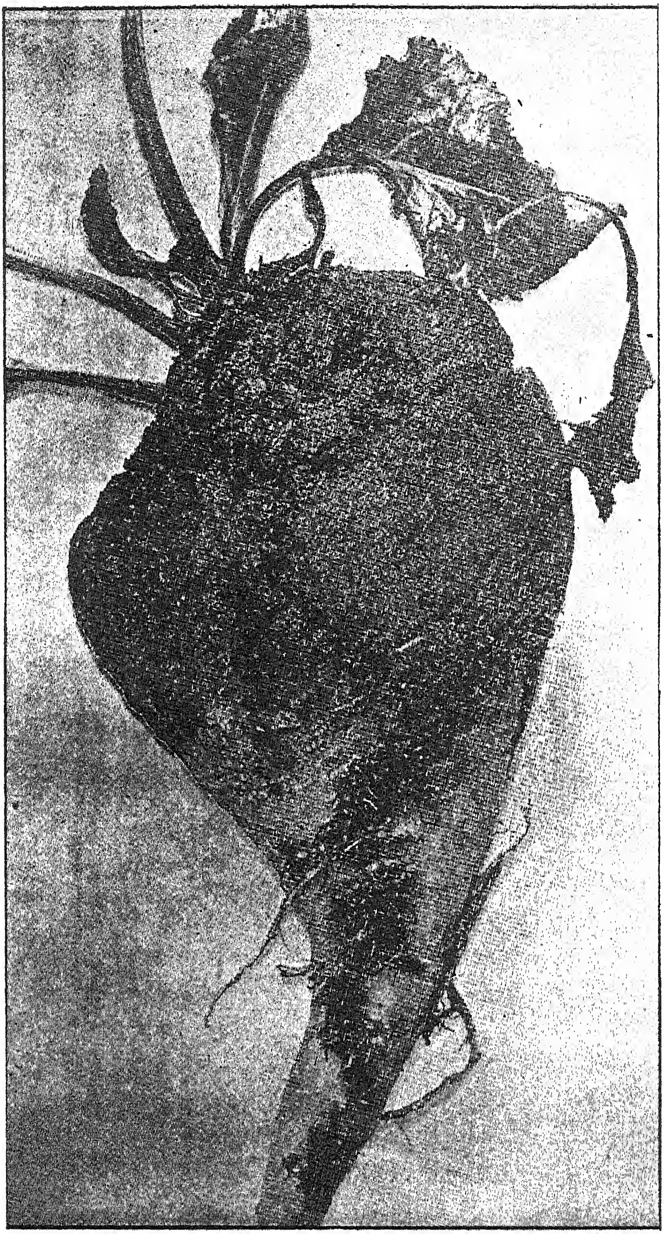


FIG. I,—A late stage of Beetroot Rot, showing the cracking and the rotting of the Root.

As the seed is slow in germinating, it should be soaked for from 24 to 36 hours in a solution of one part rain water and one part urine at a temperature of from 100 to 120 deg. F. The seeds will absorb about their own weight of the mixture, and on being taken out should be mixed with some fine wood ashes, and they are then ready for sowing. If the soil is sufficiently moist and warm, the young plants should appear in from 8 to 10 days. The seeds require a total degree of average temperature equal to 650 deg. F. Therefore if the average temperature is 65 deg. F. ten days would be required for germination. A temperature of 122 deg. F. is fatal to germination. Experience has proved that a small-sized beet contains a very much higher percentage of sugar than a large one. The best size for the sugar factory is from $1\frac{1}{2}$ to 2lbs. Some factories refuse to receive beets over 3lbs. in weight, as the expense of treating the roots is too great in proportion to the return. A small beet being required, this must be borne in mind when the time for sowing the seed arrives. As a general rule, where beets are grown for the purpose of sugar making, they should be sown in drills 16 inches apart and thinned out to about 8 inches apart in the rows. This gives about 48,000 plants to the acre, and it is only by this system of close sowing that the crop of small beets can be assured. To sow the seed at this distance apart will take between 15 and 20lbs. per acre. If the crop is only grown for the purpose of feeding stock, half this quantity of seed is sufficient, as the drills can be placed much further apart.

In sowing the seed, if only a small area of land is required to be sown, it may either be sown by hand or by a Planet jun. hand-drill; but if a large area is required several special machines are made for sowing beet or mangel seed, either on ridges or on level ground. September is the best month to sow. When the plants begin to show about four small leaves it is time to thin out all surplus plants; this can either be done by hand or by a small turnip thinning hoe, care being taken to leave the healthiest plants to grow, cutting out all the others; one plant should be left about every eight inches in the rows. Where several plants are growing in a bunch the surplus ones must be pulled out by hand. There is a turnip-thinning machine, which will thin out all the turnips or beets between the distances required, but it cannot be set narrow enough to work in drills that are only 18 inches apart. At the time of thinning, any plants that have missed can be replaced. The subsequent cultivation can be carried on by the horse-hoe with a steady horse, or by the Planet jun. hand hoe.

Very careful attention should be given to the manuring of this crop, and fresh manure should not be applied if it is possible to avoid doing so. It is much better to apply a heavy dressing of farm-yard manure to the preceding crop, and then if the soil is poor to supplement it with a dressing of artificial manure. A mixture of bone dust, superphosphate and sulphate of potash mixed together in equal quantities and applied at the rate of 3cwt. per acre should give satisfactory results.

Rich nitrogenous manures require to be used sparingly, as they tend to increase the yield of the tops and leaves, to the detriment of the root.

It is estimated that a crop of beets yielding 15 tons of roots and tops per acre takes from the soil—

	Roots. lbs.	Leaves. lbs.	Total. lbs.
Nitrogen	59·4	26·4	85·8
Potash	132·0	52·8	184·8
Phosphoric acid	26·4	11·0	37·4
Other substances	85·8	79·2	165·0
	303·6	179·4	473·0

The roots should not be harvested until fully ripe, and this will be about May. A general indication of ripeness is when the leaves turn yellow and mottled. A good indication of maturity is shown when a root is cut in two with a knife. If the newly-cut surfaces rapidly change colour on exposure to the air the roots are not sufficiently ripe; if they remain white or only turn slightly reddish it may be taken for granted they are fit for harvest. The best indication, however, is to test for the percentage of sugar, and harvest when the highest percentage is reached.

Several methods of harvesting are adopted. Some pull the roots by hand and cut the tops off and pile in heaps for carting to the factory; others again cut the tops off by means of a sharp hoe as they grow in the field and then plough the rows up and gather in the carts. Care, however, must be taken that the roots are not in any way cut about or injured below the neck, as fermentation very soon sets in, and they are then useless for making sugar.

The following table, taken from the annual report of H. A. College, gives the results of some experiments carried out by the writer at that institution. The table is useful as showing the average weight of the beets and the percentage of sugar obtained. Seventeen varieties of beets were obtained from different parts, principally France and Germany, and were tested side by side, and average samples were submitted to the Government chemist for analysis. The date of sowing was 6th October, and date of harvesting 4th and 5th February. The average yield per acre was 6 tons 5cwt. (not a heavy yield); average weight of roots, 20ozs.; and average percentage of sugar, 12·6.

Name.	Average weight of beet. ozs.	Percentage of sugar.
Vilmorin Improved	4½	17·1
Vilmorin Ameliorce	18	15·9
No. 3 Bis Roses	14	15·2
No. 2 Bis Blanches	15	14·7
No. 1 Bis Roses	14	14·7
No. 4 Bis Roses	18½	13·8
De Klein Wanzlebein	14	13·7
No. 1 Blanches	18	13·6
No. 3 Blanches	26	13·6
No. 4 Blanches	15	13·2
White Imperial Improved	18	12·7

Name.	Average weight of beet. ozs.	Percentage of sugar.
German Small Rooted	16	11·8
Allemande Acclimata	22½	11·5
Yellow Sugar Beet	15	10·6
No. 5 Bis Roses	38	9·0
White Red-top	19	8·5
No. 5 Bis Collets Verts	55	4·5

The yields varied from 4 to 13 tons per acre.

Diseases.—The three principal diseases which attack the sugar beets are the *beetroot rot.* An illustration of an affected root is shown in Fig. I. It attacks the beets when they are about half-grown and the roots gardually rot away. The rot is caused by a fungous disease, which attacks the roots and spreads very rapidly. The best remedy is to apply a good heavy dressing of lime to the ground and not to sow beets on the same ground for some time, but to carry out a system of rotation of crops.

Fig. II. illustrates the beet leaf spot fungus, a disease which attacks the leaves of the plant. It begins as small brown spots, with a reddish purple margin; the spots gradually become grey in the centre, and they gradually present a dried up or withered appearance. The best remedy is to spray the plants with Bordeaux mixture, which is composed of sulphate of copper, 4lbs.; quicklime, 4lbs.; molasses, 4lbs.; water, 20 gallons.

First: Dissolve 4lbs. of copper sulphate in 4 gallons of water in a wooden vessel.

Second: Slack 3 to 4lbs. quicklime in another vessel in 2 gallons of water and stir in the molasses; when cool mix 1 and 2 together and make up to 22 gallons. Two ounces of Paris green added to this is very effective for leaf-eating insects.

Fig. III.—Beet Scab.

Fig. III. illustrates the beet scab, which is very similar to that

which attacks the potato crop, as shown in Fig. IV. The disease is caused by a fungous growth, which is likely to attack the roots. If any previous crop in the same land has been affected by the same disease, so far as I am aware, all attempts at any remedy have failed to be effective, the only means to combat the disease being a rotation of crops and thereby killing the fungus for want of a supply of the natural conditions for its life.

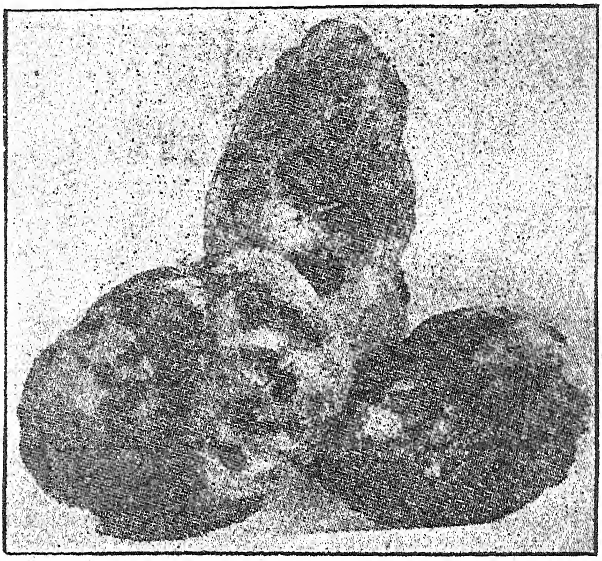


Fig. IV.—Potato Scab.

Statistics.—The total of the world's production of sugar for the year 1900-1 and preceding years (the last returns available), as given by the Department of Agriculture of the U.S.A., are:—

	1898-1899.	1899-1900.	1900-1901.
	tons.	tons.	tons.
Cane Sugar	2,998,372	2,833,534	3,420,770
Beet Sugar	5,014,472	5,607,944	6,095,859

Of which 6,020,000 tons were produced in Europe and 75,859 tons in America. These figures show that the total production of beet sugar is still nearly double that of cane sugar, and that the production is increasing in about the same ratio.

There are in the U.S.A. 31 factories for the purpose of making beet sugar, and the capital invested is 20,958,519 dollars, or an average of 676,081 dollars for each factory.

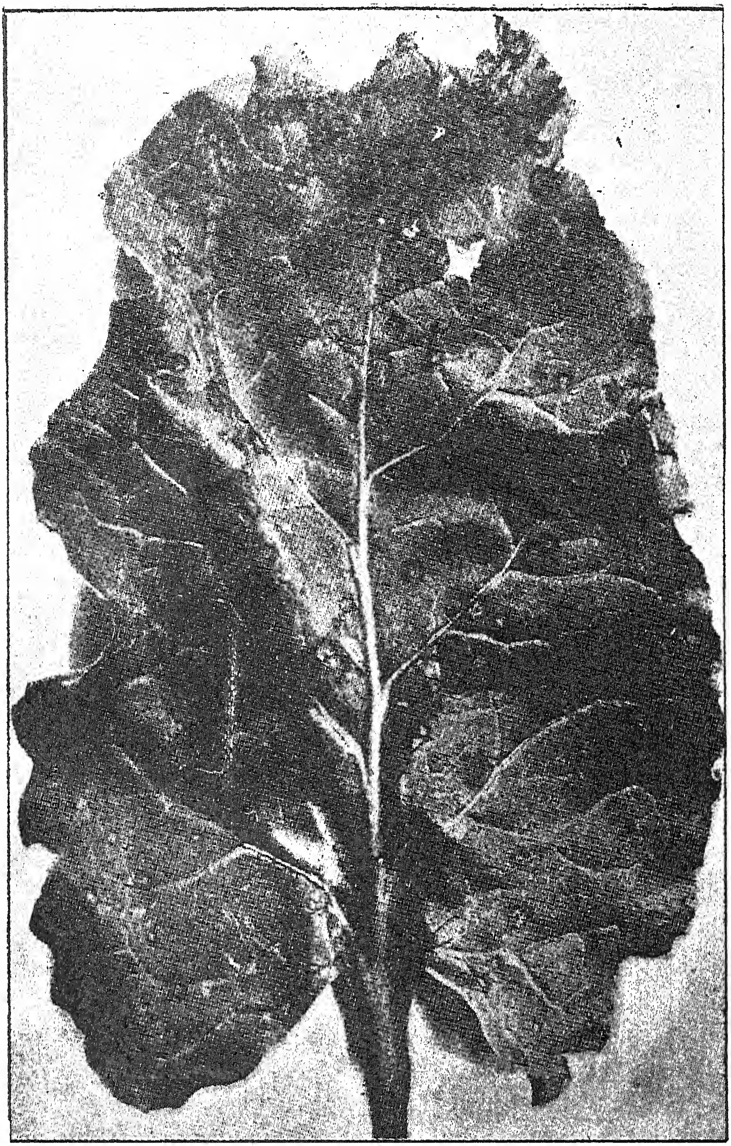


Fig. II.—A Beet Leaf, showing the early stages of injury due to the Leaf Spot Fungus.

There are 135,305 acres of sugar beets, which yielded 794,658 tons of beets, or an average of 5·87 tons per acre; the average price paid was 4·39 dollars, and the average percentage of sugar 14·5.

The factories put through from 350 to 1,100 tons of beets per day, according to the size of the plant.

Local Conditions.—We now require to consider these conditions and see how they apply to Western Australia, where the establishment of a sugar beet factory is suggested.

A small factory, to work profitably, will require to put through about 300 tons of beets per day, and the first thing to be done is to secure a supply of beets sufficient to keep the factory going. To do this for, say, nine months in the year, will require, roughly speaking, 75,000 tons of beets. Are the farmers in any district likely to club together to supply this quantity? In the second place, we come to the question of price. We find the average price paid for beets, containing 14·5 per cent. of sugar, to be four dollars 39 cents., or 18s. 3d. per ton. Some time ago an attempt was made to establish this industry on the New England tableland, where the soil is very suitable for the cultivation of beets, and an offer was made to purchase the beets on a basis of 12s. per ton for beets containing 12 per cent. of sugar, 1s. per ton extra being paid for each percentage above that point. Therefore, beets containing 15 per cent. would be worth 15s. per ton at the mill. The quantity offered would not have kept the factory going for a month, and the proposal fell through. Can our farmers raise beets and supply them to the mill at about this price?

Thirdly.—We find the cost of establishing a beet sugar factory to average about 676,081 dollars, or £135,000. Taking the cost to be £100,000, which I understand was to be the cost of the one mentioned in my last paragraph, are we likely to find a private individual or a syndicate willing to invest this capital under these conditions, always bearing in mind that we have the cane sugar factories in the North-Eastern States to compete against?

I am afraid that the answer to these questions must be in the negative, and that the cultivation of sugar beets for the purpose of sugar making is not likely to be a success, although as food for stock they will prove a valuable addition to a rather limited list of fodders grown for this purpose.

NOTES ON BOYANUP.

By A. C. Vaughan.

Boyanup, 12 miles from Bunbury, on the Preston River, is nclined to be rather sandy, but has some splendid land on the banks of the river, and some good swamps.

It is rather astonishing how, if one or two people go in for a certain crop, many people will rush and go in for the same thing. Such is the case around Boyanup. Messrs. O'Donoghue and Whistler Bros. having planted table vines, and they having done well, every one has gone in for them more or less; and I am rather afraid this class of grape will be over produced, as prices dropped heavily last season. I should think this district would produce a grape that would make a first class light wine, and it is a pity that more do not go in for this class of grape. Growers from five acres upwards want to retain the wine-making, as this is the most profitable part of their business, but they cannot afford to mature and put their wine in small lots on the market. I feel sure if a sort of co-operative cellar was established in Perth, where young wine could be bought, or deposit paid on it, it would go a long way to help an industry that at present is at a standstill, and has been for the last two or three years, vineyard property being unsaleable; a condition of affairs that is to be regretted when we take into consideration the amount of country that is suitable for this industry.

It seems rather a pity that the Government let people go stumbling on all over the country. They certainly say here is the land, and we wish to sell it, and will give you good terms. All experience up to the present has been gained by private people and private money, and some have had to pay very dearly. Settlers, when they go looking for land, naturally go to farms that exist, and if there are a few energetic up-to-date farmers about, it materially helps to settle a district. It would assist land settlement and save thousands of pounds to settlers if the Government would show people what the land can do.

Market gardening and fruit growing seem to be the right things to go in for about Boyanup, and grasses may be successfully grown in places. Paspalum dilatatum seems to be coming into favour. Several settlers showed me patches, and seemed to be very pleased with the way it is coming on, especially as it seems to do well in light sandy soils. As I have said before, too much attention cannot be given to the successful cultivation of grasses; it is the keynote to the prosperous settlement of the South-West.

Surely when one keeps hearing of the prolonged droughts in our drier districts of Australia, we should turn our attention to parts that have a plentiful rainfall. We cannot make a rainfall, but, in these days of cheap chemical manures, we can make good use of some of our poorer lands that have plenty of moisture.

Whistler Bros., Boyanup, on the Banks of the Preston.

These settlers do good for themselves and good for the district, having shrewd business qualities and any amount of energy. They have made the land produce crops profitable to grow, and showed what can be made out of a small area of land.

The Vineyard.

consists of 11 acres table grapes; varieties—Knight Centennial, Dorradillos, Muscatel, and Wartle Hall, producing from four to six tons per acre. As most of the varieties come in late, and this being a late district, they fetch a big price. The great trouble this year has been the little birds called "Silver Eyes." Messrs. Whistler Bros. consider that they lost fully £100 by them, taking into consideration labour, ammunition, and the amount of grapes damaged.

Orchard.

Eight acres apples, coming on well, two and three years old; varieties—Dunn Seedling, Yates, Jonathan, and Esopus Spitzenburg; three acres pears—Broome Park, Vicar Winkfield, and Bleau Clargeau, and a nice lot of five year old Mandarins, Lisbon lemons, Queen and St. Michael oranges. The Queen is found to be the best; the trees are well grown, and loaded with good fruit. This is the first citrus orchard of any extent that has been planted on the Preston, and is an object lesson for the district. The quality of the lemons is especially good, and so far the dreaded collar rot has not made its appearance.

Another nice little orchard belongs to Mrs. E. Buckley. Nearly all the common deciduous fruits are grown, the feature of the orchard being the success of the apricot trees. These trees, as a rule, do not grow well in this district, but Mrs. Buckley's trees are an exception. The reason seems to be that the trees are well sheltered and grown on deep well drained soil. Oulins Early and Beehive are the varieties that do best.

WATER GLASS.

The Best Preservative for Keeping Eggs.

North Dakota Experiment Station: In the last two or three years the method of preserving eggs with a solution of water glass has been often tested, both in a practical way and in laboratories. The North Dakota Experiment Station has been especially interested in the problem. In these experiments a 10 per cent. solution of water glass preserved eggs so effectually that at the end of three and one-half months eggs that were preserved the first part of August still appeared to be perfectly fresh. In most packed eggs, after a little time, the yolk settles to one side and the egg is then inferior quality. In eggs preserved for three and one-half

months in water glass the yolk retained its normal position in the egg, and in taste they were not to be distinguished from fresh store eggs. Again, most packed eggs will not beat up well for cake making or frosting, while eggs from a water glass solution seemed quite equal to the average fresh eggs of the market.

Water glass or soluble glass is the popular name for potassium silicate or for sodium silicate, the commercial article often being a mixture of the two. The commercial water glass is used for preserving eggs, as it is much cheaper than the chemically pure article which is required for many scientific purposes. Water glass is commonly sold in two forms, a syrup-thick liquid of about the consistency of molasses, and a powder. The thick syrup, the form perhaps most usually seen, is sometimes sold wholesale as low as a penny per pound in carboy lots. The retail price varies, though fivepence per pound, according to the North Dakota Experiment Station, seems to be the price commonly asked. According to the results obtained at this station, a solution of the desired strength for preserving eggs may be made by dissolving one part of the syrup-thick water glass in ten parts, by measure, of water. If the water glass powder is used, less is required for a given quantity of water. Much of the water glass offered for sale is very alkaline. Such material should not be used, as the eggs preserved in it will not keep well. Only pure water should be used in making the solution, and it is best to boil it and cool it before mixing the water glass.

The solution should be carefully poured over the eggs packed in a suitable vessel, which must be clean and sweet, and if wooden kegs or barrels are used they should be thoroughly scalded before packing the eggs in them. The packed eggs should be stored in a cool place. If they are placed where it is too warm, silicate deposits on the shell and the eggs do not keep well. The North Dakota Experiment Station found it best not to wash the eggs before packing, as this removes the natural mucilaginous coating on the outside of the shell. The station states that one gallon of the solution is sufficient for fifty dozen eggs if they are properly packed.

It is, perhaps, too much to expect that eggs packed in any way will be just as satisfactory for table use as the fresh article. The opinion seems to be, however, that those preserved with water glass are superior to most of those preserved otherwise. The shells of eggs preserved in water glass are apt to crack in boiling. It is stated that this may be prevented by puncturing the blunt end of the egg with a pin before putting it into the water.

In the East Indian archipelago salted ducks' eggs are an article of diet. The new-laid eggs are packed for two or three weeks in a mixture of clay, brick-dust, and salt. They are eaten hard-boiled. It is said that in this region and in India turtle eggs are also preserved in salt. These products, while unusual, do not necessarily suggest an unpleasant article of diet. The same can hardly be said of a Chinese product which has often been described. Ducks' eggs

are buried in the ground for ten or twelve months and undergo a peculiar fermentation. The hydrogen sulphide formed breaks the shell and escapes, while the egg becomes hard in texture. It is said that the final product does not possess a disagreeable odour or taste. Eggs treated in this or some similar way are on sale in the Chinese quarter in San Francisco, and very likely in other American cities. A sample recently examined had the appearance of an egg covered with dark-coloured clay or mud.

"GREENING" SEED POTATOES.

From a pamphlet issued by the Yorkshire College, Leeds, giving the results of various tests with seed potatoes, we quote the following extract:—

Greening.

It is usually the practice with the early potatoes, after lifting in summer or early autumn, to expose those of "seed" size to as much sunlight as possible. The potatoes are consequently greened, and it is often stated that a better crop will be obtained by using "seed" that has been exposed in this way than by planting potatoes taken from a pit in spring. A test dealing with this point was conducted last year, but it was desired to ascertain what influence, if any, similar treatment might have on a late variety. A number of Up-to-Date potatoes of "seed" size, sufficient to plant four rows, were exposed in the autumn of 1900, and greened as effectively as possible. The potatoes were then put into shallow boxes and stored in a cool shed, precautions being taken to protect them from frost. A further number of "seed" size of this variety grown in the same field were "pied" in the usual way in autumn. In March these were taken out of the "pie" before the buds had started to grow, were put into shallow boxes, and exposed to sunlight during the day alongside those that had been exposed in autumn. At the time of planting on 3rd May, 1901, it was seen that the sprouts of the potatoes that had been prepared in autumn were hardly a quarter of an inch long, and were quite green, whereas the sprouts of those that were not prepared until spring had just started growing, and both the tuber and sprout were only slightly green. The plants were first through the ground in the four rows where green tubers were used, and this was uniformly the case in each row. For a time they maintained this lead, but by the end of June there was no apparent difference between the strength of the haulm from the greened tubers and that from the ungreener "seed."

The following table shows that, when lifted, a better crop by 1 ton 9cwt. was obtained from the "seed" prepared in autumn than from that produced by "seed" prepared in spring:—

	Yield per Acre.											
	Ware.			Seed.			Chats.			Total.		
	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.
Greened	11	19	2	0	11	1	0	3	0	12	13	3
Ungreened	9	17	0	1	1	0	0	6	3	11	4	3

A STUDY OF THE DAIRY COW.

By TALPA.

QUANTITY AND QUALITY OF MILK.

Amongst farm live stock there is no animal more difficult to judge, more complex and deceptive, than a dairy cow. She is the *bête noir* of the stockbreeder. The value of most farm animals can be determined by their physical characteristics—by their shape and general appearance; and while outward form cannot be disregarded in estimating the value of a dairy cow, "looks" often count for very little in filling the milk pail, or in producing a large quantity of butter. Some very good-looking cows are often inflicted with poor udders, and not infrequently the cow having the largest "show" for milk yields a much smaller quantity than her appearance would lead one to expect. There are other points in which the dairy cow is deceptive, and which cannot be determined by the human senses, either by the eye or the hand. No dairyman can tell, for instance, how much butter a certain quantity of milk will produce until he has tested it in the machine, or by churning. It does not follow that a large flow of milk will be poor milk. There is doubtless, a tendency in that direction, but, on the other hand, there are many cows which not only yield a small quantity of milk, but milk of an inferior quality from a butter-making standpoint. The aim of the dairyman is to make a profit by his business, and, while some may strive to obtain that result by maintaining a breed of cattle, like the Holsteins for example, which are noted for their large milking properties, others prefer the Jersey, which gives a much smaller quantity of milk, but of richer quality. Both may be right, and they may also both be wrong. In the former case, however, the chances of making a profit (the largest possible, of course) are greater than in the latter, for the reason that the cows giving poor milk generally do more than make up for it by the extra yield. Quantity is the first essential in milk, and butter-fat content the second requisite. The most profitable milk is that in which these qualities are combined in the same animal, and where we invariably find our ideal dairy cow.

THE MOST PROFITABLE MILK.

The prevailing idea in many quarters is that if the quality of the milk be increased, dairying will be more profitable to the producer; and on pay day at the butter factories it is common to hear the supplier, whose milk averages 3d. per gallon, complaining and making a noise about the low price of milk, and arguing that it does not pay him to produce milk at that price. Another supplier's milk probably averages 4d. per gallon, and he is quite elated; but an analysis of their respective returns would perhaps

better return per head from his herd than his neighbour, who received 1d. per gallon more for his rich milk. To make this point perfectly plain, take, for instance, the case of two farmers, Jones and Smith. Jones owns 10 cows, which give four gallons of milk every day each, or 1,200 gallons for the month, of 3·4 per cent. milk, equalling 449lb. of butter. This, at 10d. per lb. is £18 14s. 2d. for the month. Smith has 10 other cows, which give, under the same conditions, two gallons of milk per day, or only 600 gallons per month, of 5 per cent. milk, which is equal to 339lb. of butter, which, at 10d. per lb., is £14 2s. 6d. for the month. It is easy to perceive which of the two herds is to be preferred. I have quoted extreme cases, but they will more clearly demonstrate the fact that quantity is necessary as well as quality, and that rich milk is not always the most profitable milk. We cannot increase the percentage of butter-fat in a cow's milk by extra feeding, but we can greatly increase the quantity of her yield by such means, proving that a herd of naturally heavy milkers can never be approached by a herd of naturally light milkers, no matter how well or ill the respective animals may be fed. The milk yield is regulated, to a large extent, by the amount of food supplied, but the property of giving rich milk is an inherited function, and can only be developed or attained in the animal by breeding from pure-bred stock having a reputation for that quality. We want rich milk, but we also want plenty of it.

The Marks of a Good Cow.

To tell whether a cow will give rich or poor milk, there are no outward or visible signs about the animal to guide us in the matter. The man who milks her even cannot tell how much butter is in the pail; but, thanks to Dr. Babcock, dairymen have now a simple means of testing the milk of individual animals, and weeding out the unprofitable members of their herds. Every farmer should make it a rule to test his cows regularly, and know exactly what each animal in the herd is doing. It is not sufficient to depend entirely on the returns from the butter factory, as, when the milk is pooled, it is impossible to select the most profitable cows in the herd with anything like accuracy of judgment. However, the marks of a good cow, showing whether she is capable of producing a large quantity of milk, are tolerably plain to all who are acquainted with cattle, yet there are such a variety of relative points requiring consideration that we can only picture them in the model. The best milk cow, as a rule, is of medium size, and small boned. The head is small, and rather long, narrow between the horns and wide between the eyes. The ears are thin, covered with soft, silky hair, the inside of the ears being of a rich, orange colour. The eyes are large and bright, with a placid expression; the horns set on a high pate, bending wide apart at the base, and curving inwards and upwards at the points; the neck long and thin, slender and well-cut under the throat, thickening handsomely as it approaches the shoulder, but entirely free from anything like a "beefy" appearance. The shoulder blades should meet narrow at

the top, widening gradually towards the points, which should be broad and well rounded; the ribs rather straight and wide, indicating a good digestion and constitution, for everything depends on that in a good milk cow. The loins should be broad, and the hips high and wide, the rump even with the hips, the pelvis wide, giving plenty of room for the udder; the thighs thin; the hind legs a little crooked, with a long, large foot. The skin should be soft and mellow, and of a yellow butter colour.

The Milk Veins and Udder.

The milk veins in front of the udder are usually an infallible mark of a good milk cow, and the larger they are the better the indications. In extra good cows they branch out into four arteries along the belly, but they all unite before reaching the udder. The more irregular the course the more sure you may be the cow is a good milker, but the veins give no indication of the quality or richness of the milk. The udder should be covered with a short, downy coat of hair. This hair should begin to turn its backward course from the front teats, running in this direction between the teats, then on the back part of the udder, called the escutcheon, and on as far as the vulva in the best cows. The wider the belt of this upturned hair the better. It should be short and velvety, covering a soft, orange-coloured skin. The shape and size of the udder is, however, by far the most reliable index of a good cow. All the other marks are only of relative importance, and it is better to have a scraggy-looking cow any day, with a good udder, than a grand-looking beast with a miserable bag. No matter how good looking a dairy cow may be, except she has a well-developed udder, with its accompanying network of mammary glands, she cannot be expected to excel as a pail-filler. As a rule, heavy milkers are seldom the best-looking cows, because, though good-looking animals, capable of creditably acquitting themselves at the pail, are occasionally met with, it is the almost invariable rule to find cows which are good at the pail very thin in the flesh, narrow across the shoulders, slack over the loins, and in other ways deficient from a butcher's point of view. The ideal udder is the one which is well developed both fore and aft, one that is carried high up towards the escutcheon, and at the same time goes a long way forward under the belly. In addition to this, the udder must be deep and square in shape—the deeper and squarer the better. Its four teats should be of good size, and placed as nearly as possible at equal distances apart. Cows possessing udders of this kind may always be counted on to prove good milkers, just as other cows possessing small, round-shaped udders, with teats so close together that they almost touch one another at the points, may invariably be put down as poor pail-fillers, no matter how fine their appearance may be or how good looking in other respects.

Another Good Sign.

One of the best signs of a good dairy cow, and one that will add quickly to the wealth of her owner, is a good appetite and a

smart eater. The old proverb says, "Slow at the meat, slow at the work." Let any practical dairyman who has handled numerous cows say whether he has not always found his most profitable animals quick and greedy eaters. There is a great difference, remember, between a quick eater and an insatiable eater. The former is a profitable, and the latter, an unprofitable animal. Some cows are perfect gluttons, and will readily consume more food than would be sufficient for two or three ordinary cows. But languid eating, without apparent zest or enjoyment, is a token of feeble digestion, inability to take into the system, promptly and fully, the nutritive parts of the food. The animal that eats with evident relish is not always the animal that eats longest, or that eats most, but its eagerness shows a good and healthy appetite, the result of strength and soundness of the digestive and secretive organs. Of course this sign must be taken in connection with the other signs already mentioned, and it will be found one of the most important points to observe in the study of a dairy cow.

THE CULTIVATION OF MAIZE FOR FODDER.

In countries where a low rainfall and frequently recurring periods of drought make the growth of roots rather uncertain, maize offers the opportunity of securing a large bulk of succulent material that may, to a considerable extent, replace the common fodder crops.

While this crop may be grown on a variety of soils (sand, clay, and fenland), it is found to give its best return on a mild, deep loam. The land should be ploughed early, so as to secure a good tilth, and in spring the ground should be cleaned and generally prepared as for roots. Ten or twelve tons of farmyard manure per acre, supplemented, when the crop is above ground, by 1cwt. of nitrate of soda, would be sufficient manuring. Where the natural fertiliser is not available, artificials may be resorted to, a suitable mixture consisting of 1cwt. sulphate of ammonia, $\frac{2}{3}$cwt. superphosphate, and a similar amount of kainit on light land. The seed may be sown from the middle of October till the middle of November, though the young plants run risk of injury from frost in the case of October sowings. In America there are varieties of maize specially adapted for fodder purposes, and probably some of these are well adapted to our conditions. But results considered sufficiently satisfactory are got in this country from the use of the 90-day maize.

The seed may be sown in a variety of ways, *e.g.*, by hand dibbling, by means of a bean drill, etc., the best results being attained by placing the rows not closer than 16 inches, and by

burying the seed to a depth of about $2\frac{1}{2}$ to 3 inches. The quantity of seed varies between one and two bushels per acre. Heavy rolling after sowing is recommended by several of the best growers.

When the young plants appear horse and hand hoeing must be attended to, as in the case of other drilled crops; but when once fairly established, maize, being a rank-growing plant, reaching a height of five or six feet, will largely suppress weeds.

The crop may be utilised in several ways. It is found to be very useful for scattering on bare pastures in the late summer months, where it is readily eaten by all kinds of stock, not excluding pigs. In America, and to some extent in this country, the main value of the crop is due to the opportunity it provides, through the agency of ensilage, of furnishing a supply of nutritious succulent material for use in the winter and spring months.

The quality of the silage that maize produces is excelled by that of no other crop. If maize be utilised in this way it should stand till the cob is formed, and in the milky stage, though it must be got off the fields before the occurrence of autumn frosts. Generally speaking the latter half of February to March is the best time to make maize silage, which may be produced in stacks, drawheaps, silos, pits, etc. The practice of several farmers is to utilise as much of the crop as possible in a green condition, and make what remains into silage. In order to admit of the completion of the fermentative changes it is desirable not to feed maize silage to stock till well into spring. At that time a good sample is of a brownish green colour, and emits an aroma almost indistinguishable from that of strong tobacco. It is much relished by stock, and seems to have a feeding value superior to that of mangolds.—*Journal of Agriculture*, London.

DRAUGHT HORSES.

By R. E. Weir, M.R.C.V.S.

Having desired my assistance in writing certain articles for the *Agricultural Journal*, the chief difficulty that presented itself was on what subject to write which would prove of most interest to your readers. As most of these are engaged in agricultural pursuits, and therefore interested in draught horses, I have determined to make these animals the subject of my first paper.

Importation of Draught Horses to W.A.

During the past 12 months about 1,200 of these animals have been imported, chiefly from Victoria, which is certainly the home of this particular class. As the average cost of a draught horse is about £40, it may easily be seen that no less a sum than £48,000 has been expended. Now, I have not the slightest doubt that this money might have remained in the State if those engaged in farming pursuits would only give greater attention to the matter. Unfortunately in the past there have been too few on the land, but now that farms are being opened up all over the State, I see no reason why a sufficient number of these animals should not be obtained locally. Anyone who may have visited the Agricultural Shows of Northam and York during, say, the last two years, could not but have been impressed with the magnificent show of foals exhibited there, and had the necessary care been taken with them it is needless to say they would have supplied the class desired. Several instances now occur to me where the local breeders have made names for themselves, notably the Dempsters and Throssells, of Northam; Craigs, of York; and Bateman, of Beenup. I mention these names merely to disprove the statement which has frequently been made that it was impossible to breed this particular class of stock in this State. A number of animals, sold by the people above-mentioned, are daily working side by side with those imported, and are proving equally serviceable. As I stated before, it is to the farmers we must look to supply the market with this particular stock, therefore the number of animals available will depend entirely on the number of people who take to the land.

The Lands Department have offered special inducements to selectors; and, as advantage has largely been taken of these opportunities, I have no hesitation in saying that in a very short time all the requisite animals will be easily obtained from the farms of the State. As this is an enterprise in which a large amount of money may be made, particular care must be taken in the first instance with regard to the sires. To assist the agricultural societies, I would suggest that the Government should render assistance in providing suitable stallions. A committee, consisting of two practical breeders and a qualified veterinary surgeon, should be appointed by the State to examine all stallions, and a registration fee should be charged on all those regarded by them as suitable for stud purposes.

This will serve as an introduction to this vast field of revenue, and in a future paper I shall treat more particularly of the management of this serviceable and always required animal.

CEREBRITIS OR "STAGGERS" IN HORSES.

EXPERIMENT STATION, MANHATTAN, KAN., U.S.A.

Serious losses in this and adjoining States are occurring at the present time as a result of feeding wormy, mouldy corn, either when it is fed as a grain ration or when obtained by pasturing in the stalk fields, or when fed upon the cut corn fodder.

The disease is an inflammation of the brain or spinal cord, and its coverings (meninges) associated with a breaking down of the nerve tissue of the brain. It is popularly called "staggers," or "mad staggers," because of the prominent symptoms shown.

Symptoms.—The symptoms are those of a brain disease. The animal appears blind and only partially conscious; there is often a tendency to turn in a circle to the right or left, and a staggering or a straddling gait. There is usually a trembling of the muscles. As the disease progresses the animal becomes delirious and easily excitable. In many cases the animal will stand with the head or breast against a wall or manger and push. Animals will often eat when badly affected, apparently from force of habit, not because they are hungry. In some cases animals will die in a few hours after they are first noticed ailing. Most of them die within a few days; a few live a week, rarely longer. In a few cases the spinal cord is diseased, while the brain remains nearly normal. In these cases there is inability to control the muscles, or the animal may be unusually sensitive, the least irritation of the skin, even by touching the animal, often causing it to kick violently. Where the spinal cord only is affected, the animal frequently recovers. Laxative food should be given, and iodide of potash in one-drachm doses, dissolved in water, can be given once daily for three or four days.

Treatment.—Practically all cases, where the brain is the seat of the disease, die, and all methods of treatment so far have proven of no value. The animal should be placed where it will be comfortable, and cannot injure itself or other animals, and supplied with soft, laxative food, such as thin bran mashes. The only treatment for the disease is preventive, by avoiding the wormy, mouldy corn.

Care should be exercised in handling a horse to avoid injury, as the animal is irresponsible and often in a delirious frenzy.

In some cases horses do not begin to die for a month after being turned into the stalk fields, and they may contract the disease in a week, and in some cases ten days, after the mouldy corn has been withheld.

Mouldy or wormy corn does not seem to be injurious to other animals, and can be fed to cattle and hogs without danger.

MANURES AND MANURING.

By A. Despeissis.

The fruit-grower, having secured fruit trees and vines suitable for the purpose he has in view, will find few more profitable investments than the expenditure of a few shillings per acre in suitable manures for the purpose of adding to the fertility of the soil or restoring the elements of plant food extracted from it by the crop.

The science of agricultural chemistry has thrown such light on the question of fertilisers and in the study of the requirements of cultivated plants that we are now able, with a certain amount of certainty, for every pound spent in suitable manures to expect a good return.

Few soils can do without manure of some sort in order to yield a maximum crop. Occasionally some, however, are, if anything, too rich and too forcing for the purpose of fruit-growing; they induce an extravagant growth of leaves and wood to the detriment of the fruit. Wine grapes on such soils produce a must of little value for the purpose of wine-making as compared with must from similar grapes grown on poorer ground.

Most soils respond liberally to the application of suitable manures, and in order to satisfy the requirements of the crops entrusted to them, some knowledge of what is plant food and how plants feed must necessarily prove helpful.

What is Plant Food.

Plants, in order to live and fructify, require certain elements of food, fourteen in number, some of which are supplied by the air, and some are found in the soil. Those supplied from the air are combinations and compounds of carbon, hydrogen, and oxygen, they constitute, with the compounds of nitrogen and sulphur, which, in the case of fruit trees, are obtained from the soil, the organic part of the plant, which on combustion, either by fire, fermentation or putrefaction, return entirely or partly to the air. The mineral part of the plant which is represented by the ashes left behind after complete combustion constitute the inorganic constituents, which consist of potassium, phosphorus, calcium, magnesium, iron, silicon, sulphur, sodium, chlorine, and manganese.

Some knowledge of the composition of the tissues of plants and fruits will be useful for understanding in what proportion the different elements indispensible for plant growth occur in most crops.

Nearly two-thirds consist of *water* which disappears on dessication, and the balance is made up of combustible *organic matter* (carbohydrates), such as fibre, starch, sugar, gum, oils, alkaloids, and albuminoids, gluten, albumen, etc.; and also one to three per cent. of mineral or *inorganic matters* represented by the ashes.

To agricultural chemistry and such works as those of Wolff, in Europe, and Professor Hilgard, of the University of California, we owe a great deal of the knowledge we at present possess, respecting the:—

MINERAL CONSTITUENTS OF THE ASHES OF VARIOUS PLANTS.

	Potash.	Lime.	Magnesia.	Iron.	Phosphoric Acid.
Apple	35·68	4·08	8·75	1·40	13·59
Pear	54·69	7·98	5·22	1·04	15·20
Plum	59·21	10·04	5·46	3·30	15·10
Prune	63·83	4·66	5·47	2·72	14·08
Orange	48·94	22·71	5·34	0·97	12·37
Lemon	48·26	29·87	4·40	0·43	11·09
Grape	63·14	9·05	3·97	0·06	10·42
Peach	74·46	2·64	6·29	0·58	16·02
Apricot	59·36	3·17	3·68	1·68	13·09
Fig	48·60	9·12	5·32	0·84	11·20
Strawberry ...	49·24	13·47	8·12	1·74	18·50
Almond	27·95	8·81	17·66	0·55	43·63
Cherry	51·85	7·47	5·46	1·98	15·97
Damson	45·98	12·65	8·17	1·19	13·83
Olive	60·07	15·72	4·38	1·19	8·35
Gooseberry ...	38·65	12·20	5·85	4·56	19·68
Quince	27 39	7·79	13·11	1·19	43·32
Chestnut ...	39·36	7·84	7·84	1·03	8·25

The above table taken from a paper on orchard manures by Mr. H. C. L. Anderson, M.A., formerly Director of Agriculture, N.S.W., gives an insight into the composition of the ashes of 18 of the most extensively cultivated fruits. Thus says Mr. Anderson:—Run down the column of figures under potash and see how widely the percentages differ—the ashes of peaches containing nearly 75 per cent. of that mineral (potash), and the ashes of apples not half as much. Then look at the figures under phosphoric acid, and see how they vary, from nearly 44 per cent. in the ashes of almonds and quinces down to less than one-fourth of that amount in grapes, and less than one-fifth in olives.

The other columns are not deserving of special attention, and are given merely to convince the student that the substances lime, magnesia, and iron are of lesser importance when compared with potash and phosphoric acid.

In practice four only of the fourteen mineral contituents of plants are, in the majority of cases, supplied to the crop under the form of fertilisers, and these are nitrogen, potash, phosphoric acid, and lime; the first three especially are the most sparsely distributed in soils and are also the most costly to replace.

With every crop of fruit removed from the orchard the available stores of postash, phosphoric acid, and nitrogen in the soil are correspondingly diminished.

Fertilising Matter removed by various Fruits.

(From analyses by Mr. G. E. Colby, University of California.)

Fresh Fruit. 1,000 pounds.	Total Ash.	Potash.	Lime.	Phosphoric Acid.	Nitrogen.
	lbs.	lbs.	lbs.	lbs.	lbs.
Almonds* ...	17·29	9·95	1·04	2·04	7·01
Apricots	5·08	3·01	·16	·66	1·94
Apples	2·64	1·40	·11	·33	1·05
Bananas	10·78	6·80	·10	·17	·97
Cherries	4·82	2·77	·20	·72	2·29
Chestnuts ...	9·52	3·67	1·20	1·58	6·40
Figs	7·81	4·69	·85	·86	2·38
Grapes	5·00	2·55	·25	·11	1·26
Lemons	5·26	2·54	1·55	·58	1·51
Olives	13·50	9·11	2·43	1·25	5·60
Oranges	4·32	2·11	·97	·53	1·83
Peaches	5·30	3·94†	·14†	·85†	1·20†
Pears	2·50	1·34	·19	·34	·90
Prunes, French ...	4·86	3·10	·22	·68	1·82
Plums	5·35	3·41†	·25†	·75†	1·81
Walnuts*... ...	12·98	8·18	1·55	1·47	5·41

* Including Shells. † Estimated.

The above table shows that the drain of *Potash* on the soil from the removal of fruit crops is most marked in the case of olives, grapes, figs, peaches, prunes, apricots, lemons, and oranges, in succession, and least in almonds, apples, pears, plums, and cherries.

Phosphoric Acid is higher in the ashes of quinces, almonds, olives, figs, strawberries, grapes (seedless varieties have less), peaches, lemons, oranges (except seedless varieties), and less in apples, pears, and cherries.

In *Nitrogen* olives comes first, followed by peaches, figs apricots, oranges, grapes, plums, lemons, while the fruits poorer in nitrogen are apples and pears.

Lime is extracted from the soil by lemons, oranges, olives, and figs to a greater extent than by other fruits.

These analyses throw some light on the great sustaining power of the olives and figs and nuts, which form an important part of the diet of the inhabitants of those southern parts of Europe and northern parts of Africa which encircle the Mediterranean.

They also show that the drain on the soil is greater in the case of the orange than in that of the apple, while the former is also more nourishing.

Weight of One Acre of Soil and of its Constituents.

To the untrained mind the perusal of a statement of a soil analysis conveys no tangible idea of the amount of the constituents declared therein and contained in any definite depth of soil on, for instance, one acre of land. An approximate idea of the

weight of average agricultural land gives a relative idea as to its richness or deficiency in any of the manurial constituents. One acre contains 43,560 square feet of surface, and a depth of one foot of that area therefore contains 43,560 cubic feet of soil. The weight of one cubic foot of soil varies greatly from the heaviest—rocky and and sandy soils—to the lightest—peaty and clayey soils. The average ordinary agricultural soil weighs about 80lbs. per cubic foot, so that the total weight of one acre of dry soil, one foot deep, would be 3,484,800lbs, or, say, 3,500,000lbs. This being so, a rich soil containing one per cent. of potash or phosphoric acid would contain 35,000lbs. of such plant food on an acre one foot deep. Similarly should the analysis disclose ·1 per cent. the amount on that area would be 3,500lbs. and a crop removing, say, 50lbs. of potash or of phosphoric acid a year would thus take 700 or 70 years, as the case may be, to exhaust such a soil absolutely of either of the substances referred to.

Although theoretically that lapse of time would be necessary for the crops to entirely drain that soil of its potash or some of the phosphates, it is nevertheless found that beyond a limit the soil tenaciously holds up and refuses to part in favour of the crop with the whole of its elements. It then becomes imperative to either restore to the ground those elements of plant food which have been removed or by fallowing and spelling provide fresh supplies from the deeper strata and from the upper layer itself by the process of weathering. It is fortunate that the future is thus protected against the rapacity of the present. An examination of one of our own soils, a free dark chocolate loam, on the bank of a brook, will serve as an example of the teachings which soil analysis conveys to the mind. The land in question is under black wattle, flooded gum, and blackboys, and looks very fertile. Its analysis is as follows:—

Moisture	8·0200
Organic Matter	13·9900
*Phosphoric Acid	0·0255
*Potash	0·0848
Oxide of Iron and Alumina	1·7165
Carbonate of Calcium	0·6400
Soluble Silica	0·3660
Insoluble Silica	73·9260

*Nitrogen	0·420
Equal to Ammonia	0·510
*Sodium Chloride	0·3714
Magnesia Chloride	0·1504

This analysis shows that the land in question is a free dark loam. It contains 74 per cent. of sand and is also rich in humus.

Approximately, one acre of that soil, one foot deep, contains:—

Of Potash	·350 × 85 =	2,975lbs.
Of Phosphoric Acid	·350 × 25 =	812lbs.
Of Nitrogen...	·350 × 42 =	14,700lbs.
Of Salt (Sodium Chloride) ...	·350 × 37 =	12,950lbs.
Of Magnesium Chloride	·350 × 15 =	5,250lbs.

Supposing this land was cropped annually, and the crop removed from the ground 50lbs. each of potash, phosphoric acid, and nitrogen, the ground would be completely exhausted of the first in 600 years, of the second in 16 years, and of the third in 3,000 years.

This assumption, however, would be entirely unsupported in practice. The high percentage of salt is an indication that the land in question is badly drained; in fact, it is often waterlogged, and the soluble salts, instead of being washed out of the ground, accumulate to an alarming extent. The roots, then, of the more tender crop plants instead of feeding on a layer of soil one foot deep, would rot and corrode and only penetrate to a few inches. The mass of plant food revealed by chemical analysis is in practice found to be beyond the reach of the crops, and, besides, whatever amount of that plant food lies within reach of the shallow roots of the crop is of such a crude and raw quality that it is not in a fit state to act as plant food.

Different Sources of Fertilisers.

According to their origin or the sort of food stuff they supply to plants, manures are spoken of as:

"Animal Manures."—These are characterised by the large quantity of nitrogen they contain, and the ease with which they decompose and yield their fertilising matter in available form—*e.g.*, guanos, desiccated blood, bones, and superphosphate.

"Vegetable Manures," which undergo decomposition more slowly; some, as the leguminous plants, having a large percentage of nitrogen—*e.g.*, green manuring, farmyard manure, sea-weeds, and oil-cakes.

"Mineral Manures," which are extracted from minerals, and yield ash constituents to plants—*e.g.*, sulphate of ammonia, of lime, of potash, nitrate of soda, of potash, lime, etc.

Then again, manures are spoken of as "general" manures when they contain all the necessary elements for plant growth, or "special manures" when they only supply one or several of these elements.

These elements, again, are said to be "dormant," "latent," or "active," according as they are insoluble or soluble in the corroding liquid which exudes from the rootlets and are thus made available for plant food or are locked up in an inert form in the soils.

Fertilisers, however, for the practical purpose of the fruit-grower and farmer, should be better considered as nitrogenous, phosphatic, potassic, calcareous fertilisers, according as nitrogen, phosphoric acid, or potash, or lime is the predominating valuable constituent.

Nitrogen is the rarest and most costly element of plant food; it occurs in abundance in the air as free nitrogen, but is not available

in that form to most crops, except those of the leguminous class, on whose roots are gall-like swellings known as root tubercles, which are formed under the influence of micro-organisms living in the soil. It has been found that the presence of these bacteria and root tubercles enables some plants to draw from the vast stores of nitrogen in the air a supply which will enrich the ground in that valuable element and enable it to grow more abundant crops.

The more common source of nitrogen on the farm or at the orchard is found in farmyard manure, which consists of—

Farm Yard Manure.	Water ...	70	
	Organic Matter	27	—Nitrogen, ·4 to ·65 per cent.=9 to 15lbs. per ton.
	Ash	3	Phosphoric Acid, ·2 to ·5 per cent.=4 to 10lbs. per ton. Potash, ·3 to ·6 per cent.=5 to 13lbs. per ton.
		100	

A good dressing per acre, 5 to 10 tons.

The other forms of organic nitrogen, *i.e.*, the nitrogen of animal and vegetable matters which is chemically united to carbon, hydrogen, and oxygen, are—

Ammoniacal Guanos.—Are the best of the concentrated complete manures, as they have nitrogen 8 to 12 per cent., phosphates 15 to 25 per cent., and a little potash. It is a very valuable manure for most crops, but is rather expensive. It more nearly resembles farmyard manure in its composition than other artificial manures, and its great use is to replace this manure when it is scarce. A good dressing, 2 to 3 cwts. to the acre.

Dried Blood.—The refuse of slaughter house, being a very complex substance, it is also a very valuable manure, contains nearly as much dry matter as flesh—*e.g.*, about 23 per cent. When dried without other substances it contains about 10 per cent. water and 8 to 10 per cent. ammonia, with a little phosphate and traces of potash. It is one of the best forms of manures in light lands, and is not readily washed away. Often mixed with gypsum, which decreases its value; useful for making composts. Fair dressing per acre, 3 to 4cwt.

Dried Nightsoil or Poudrette.—Contains 2 to 4 per cent. nitrogen, 3 per cent. phosphate, and 1·5 per cent. potash; often mixed with gypsum and earth, which reduces its value. A bulky manure which would hardly pay to carry a long distance, when freight and carriage is a consideration.

Other forms of organic nitrogen are those of seeds, such as cotton seed cake and other oleaginous seeds after the extraction of the oil.

Leather and peat are also classed as nitrogenous manures, but they are comparatively slow in their effect on vegetation, and for that reason are less valuable.

Nitrogen occurs as minerals and notably ammonium salts and nitrates and nitrites.

Sulphate of Ammonia.—Supplies one of the cheapest forms of nitrogen in the market. When pure, contains 24 to 25 per cent. of ammonia, equivalent to 20 of nitrogen, and is one of the most concentrated forms of nitrogen available. It is obtained from coal gasworks and extracted from the gas liquor, and is purified of the ammonia thiocyanate (a plant poison) it contains before being put in the market. As it is not quite so soluble as nitrate of soda, it is not so liable to be washed out of the soil as are nitrates. A simple test for showing the absence of most, at any rate, of the impurities with which sulphate of ammonia is likely to be adulterated is to throw a pinch of the sulphate on a red hot iron plate; the sulphate of ammonia, if pure, will be quickly volatilised and dissipate entirely. Applied at the rate of ½ to 1½cwt. per acre in the spring, mixed with some dry, well-ground material such as sand, earth, or other fertilisers, so as to ensure its even distribution.

Nitrate of Soda.—As imported from Chili, contains rather more than 15 per cent. of N. or 18 to 19 per cent. ammonia. Its price is almost prohibitive in Australia. More soluble than sulphate of ammonia, and for this reason especially useful in a dry season, owing to its being deliquescent. Applied at the rate of ½ to 1½cwt. per acre in the spring, mixed with some dry, well-ground material, so as to ensure its even distribution.

Soil or manure analysis often express the nitrogenous contents as nitrogen or as ammonia. And in order to better understand the difference between the amount of each, it is useful to remember that 17 parts of ammonia ($N.H._3$) contain 14 of nitrogen (N.) and that 66 parts of pure sulphate of ammonia, or 85 parts of nitrate of soda, also contain 14 parts of nitrogen. Excess of organic nitogenous manures, it should be borne in mind, are often productive of harm, and cause such diseases as "die back" of the trees. In white-ant infected districts it must also be used with caution. "I have used sheep manure for orange trees," writes a Narra Tarra fruit grower; "it acts very well, but proves a hotbed for white ants."

Phosphorus is, next to nitrogen, the most costly ingredient of fertilisers, in which it occurs in the form of phosphates of lime, iron, and aluminum, or, in case of superphosphates, partly as free phosphoric acid. In good soils it rarely exceeds 2 per cent.

The trade uses with regard to phosphoric acid several terms which to the layman are not very familiar, thus:—

Soluble phosphoric acid implies phosphoric acid or phosphates that are soluble in water or in a solution of ammonium citrate. It diffuses into the ground and thus reaches the feeding rootlets of the crop instead of lying inert in the soil, as do the mechanically-mixed insoluble phosphates, until the rootlets find them out and attack them.

Insoluble phosphoric acid requires a stronger solvent than ammonium citrate to make it available as plant food.

Reverted, reduced, or precipitated phosphoric acid is phosphoric acid, which was once soluble in water, but which, by combination with lime, iron, or aluminum in the soil, has become insoluble again. In that form it is, however, readily assimilated by crops.

The chief sources of phosphatic manures are:

Bones are found in commerce broken up as "half-inch," "quarter-inch," and as "bonedust;" the finer the better, as they act more quickly. Commercial bones are either "raw" or "steamed" and degelatinised. Their respective composition is—

	Raw Bones.		Steamed Bones.
Water	10 per cent.	...	10 per cent.
*Organic matter	33 "	...	18† "
Phosphates ...	50 "	...	58 "
Carbonate of lime	4 "	...	8·5 "
Sand	·3 "	...	1· "
Alkaline salts ...	2·7 "	...	4·5 "
	100·0		100·0

* Equal 3·5 to 4·5 ammonia. † Equal 1·4 ammonia.

Bonedust and half and quarter-inch have a similar composition to the raw product they are made from. The coarser the bones the heavier should the dressing be. Bonedust is applied at the rate of 3 to 4cwt. to the acre.

Phosphatic Guanos, such as Abrolhos and Sharks Bay guanos contain 44 to 46 per cent. of phosphate and only ½ per cent. of ammonia, the balance being mostly sand and moisture. They can be got in several ton lots at a very reasonable price, and answer well when mixed with a small proportion of a more soluble phosphate, such as concentrated superphosphate and sulphate of ammonia. A fair dressing would be 3 to 4cwt. to the acre.

Thomas' Phosphate Powder, or Basic Slag, is another source of phosphates. It is derived by means of the Thomas Gilchrist process in making steel from pig iron by smelting it in converters lined with lime; when the iron is melted the air is blown through, part of the iron and impurities are oxidised, and the phosphoric acid combines with the lime, forming phosphate of lime. This contains 14 to 17 per cent. of phosphoric acid, equal to 30 to 36 per cent. of phosphate of lime, and also 40 per cent. lime, and 18 per cent. iron oxides, and 6 per cent. sand. It is very cheap in England, where it sells at the factories for £1 a ton, and is retailed at 30s. It is so finely divided that it acts very readily.

Coprolites and Apatites constitute mineral phosphates of great value, either ground into a fine powder or for making super phosphates; they occur in some geological formations under the form of concretions, and consist of the fossil excrements and remains of extinct animals. They vary in richness from 10 to 75 per cent of phosphates.

Superphosphate of Lime.—Either of the raw materials referred to already are ground and treated with sulphuric acid, thereby

made more soluble and hence quicker in its action. The actual composition of superphosphate varies with the material of which it is made, and ranges from 35 to 40 per cent. down to 20 per cent. phosphates rendered soluble. In this state, owing to its diffusibility, superphosphate is able to permeate through a greater quantity of soil, and penetrates further than other merely mechanically-divided phosphates, and thus more readily taken up and assimilated by crops. A good dressing consists of 2 to 4cwt. per acre; or, in conjunction with farm-yard manure, 2cwt.

Fermented Bones can readily be prepared on the farm by mixing with bones $\frac{1}{3}$ their weight of earth or burying them in the manure heap, moistening them with water, urine, or liquid manure, and covering the whole heap with earth. After a time, depending on the temperature, the bones enter into fermentation, and crumble to powder when they are dug out and used. Fermented bones act more rapidly than raw bones, and can be compared in their action to bone superphosphate.

The relation of phosphoric acid (P_2O_5) to phosphate of lime ($Ca_3 P_2 O_8$), such as is expressed in soil or manure analysis, is as 142 is to 310 or a fraction less than half. Thus bonedust containing 50 per cent. of phosphate of lime contains somewhat less than half this amount of phosphoric acid, or, in exact figures, 22·58 per cent.

Potassium is the constituent of a fertile soil or of fertilisers which ranks third in costliness. It does not occur as such, but as combinations, such as chloride (muriate), sulphate, carbonate, nitrate, silicate, etc.

Potash is also known as potassium oxide (K_2O), and as such is reckoned when valuing fertilisers.

In manures it occurs as sulphate and as muriate (chloride of potassium), the sulphate form being a little more costly than the muriate.

The chief sources of potash are—

Wood Ashes, which constituted for a long time the chief source of supply of potash used for agricultural purposes. The incombustible part of "ash" of farm crops and timber contains from one-fourth to one-third its weight of potash. For this reason newly cleaned land, well timbered, on which the wood has been burnt off the ground, will have an ample supply of potash to supply the requirements of the crops for some seasons, at all events.

Kainit is, on account of its low price in Europe, in great favour as a cheap form of potassic fertiliser. Owing to its great bulk, however, the price in Australia is about double what it is in England. It is chiefly extracted from salt mines in Germany, and was originally deposited from sea water, and is associated with salt, gypsum, and other saline substances. The crude kainit found in commerce contains 12 to 13 per cent. of potash (equivalent to about 25 per cent. sulphate of potash), 27 to 30 per cent. of magnesia salts of little or no use as a manure, and 30 per cent. of common

salt, which in the Eastern districts of this State, particularly when the land is in places more or less permeated with saline matters, could certainly be dispensed with. It is more valuable in light loam than in heavier soils, which it makes more sticky. A fair dressing per acre would be from 3 to 6cwt., mixed with other fertilisers, and worked into the soil by means of the plough or the digging harrows.

Sulphate of Potash, which is the chief potash salt in kainit, is also sold in a more concentrated form than in that crude salt, and if found in commerce with a percentage of 50 to 54 per cent. of potash, or more than four times the amount per cent. found in kainit. Although its price is considerably higher than that of kainit, at the same time, growers far inland will find it more advantageous wherever freight and cartage is a consideration, the fertiliser being four times more concentrated; 1cwt. per acre forms a good dressing, in conjunction with other manures.

Chloride, or Muriate of Potash, is the most soluble of the various salts of potash, and when purified contains as much as 63 per cent. of potash or 80 per cent. muriate of potash. It is obtained as a by-product in the manufacture of chlorate of potash, in the purification of nitre and other manufactures. Its use, however, is harmful on certain crops, as in the case of sugar beets, in which it lessens the percentage of crystallisable sugar, while potatoes are rendered waxy, and the tobacco leaves are deteriorated in value; in the soil it is, besides, apt to give rise to the formation of common salt, while the sulphate gives rise to the formation of gypsum, which, in saline soils, is especially of value.

In soils it occurs in quantities ranging from ·01 to 2 per cent., equivalent to 350lbs. to 70,000lbs. per acre taken to a depth of 1ft.; it is derived from the weathering of minerals containing it as an ingredient, and chiefly from felspars, one of the constituents of granite. It may be said that a soil showing ·03 per cent. of potash on analysis does not usually need a potash fertiliser. Crops not fed on the ground remove amounts of potash which vary greatly. Beets may remove as much as 100lbs. per acre, and cereals about 30lbs. A table given above (p. 33) gives the relative likings of various fruit crops for potash. The percentage of that element of plant food in soils usually rises with their contents of clay. Reclaimed swamps and sandy soils are almost invariably benefited by the application of potash fertilisers.

Soil Amendments or Improvers.

Besides the fertilisers reviewed in the previous pages, soils often need the application of methods of fertilising, which exercises on them both a mechanical and a chemical effect.

Amongst the most commonly used amendments are:

Lime, which is especially valuable for the renovation of worn-out soils and for breaking down stiff clay and making it more friable and pervious to water; it supplies plant food; it assists in the decomposi-

tion of organic matter, and for this reason a soil poor in *humus* should receive more sparing applications of lime than soils of a peaty nature, or rich in organic matter; it sweetens sour soils in neutralising the acids; it decomposes injurious substances in the soil (ferrous oxide, a plant poison, into ferric oxide, a plant food); it promotes the process of nitrification by encouraging the presence of special micro-organisms; it increases the fertility of the soil by helping some of the chemical processes which result in the more ready absorption by the soil of phosphoric acid, potash, and ammonia. Clay soils which show a tendency to "puddle" and form clods when improperly tilled, are greatly improved by a dressing of lime. This substance possesses the property of flocculating or coagulating the clay particles, thus opening the pores of such soils and making them less retentive of water and more permeable to air.

Quick or caustic lime, which results from the burning of limestone or carbonate of lime, is, chemically speaking, carbon oxide (Ca.O). It acts more energetically than carbonate of lime, or mild lime, and should be preferred for soils rich in organic matter and on sour soils.

Oyster shells and marble give the purest lime. Our coastal limestone is not so good, and contains from 6 to 20 per cent. of sand. When exposed to the air, or when moistened, quick lime absorbs carbonic acid gas, and reverts to carbonate of lime ($Ca.CO_3$), becoming *slaked lime*. During this process it increases considerably in volume, and falls to powder. A bushel of good stone lime weighs, when quick, 90lbs.; when slaked, it will measure nearly three bushels; each of which will weigh about 45lbs. A bushel of unslaked oyster shell lime weighs 60lbs. When slaked it will measure something over two bushels, each of which will weigh 40lbs.

The quantity of lime to use at one application depends on the amount of vegetable matter the soil contains. Thirty bushels of lime (12cwt.) is a safe application if the soil is quite thin and contains but little vegetable mould. Several small applications of lime are safer than one heavy one. Gas lime is another fairly cheap source of agricultural lime. It rarely, however, contains more than 40 per cent. of lime, the rest being made up of moisture and compounds of sulphur or sulphites and sulphocyanates, which are injurious to vegetation, and should be allowed to be corrected by the action of the air before being ploughed in. During this operation the noxious sulphites are converted into gypsum (sulphate of lime). Limekiln ashes are also desirable land amendments; they contain about one per cent. each potash and phosphoric acid, besides some lime.

For the destruction of sorrel, heavy liming is recommended, and applications amounting up to two tons to the acre may be used for that purpose.

Chalk is dug out and exposed to frost, and then spread, as it is constituted by minute microscopic shells, as well as fragments of shells of larger size; it contains a little phosphoric acid generally in

combination with lime as phosphate of lime, to the extent of 0·10 to 1·25 per cent. (or 100 lbs. of this burned lime contains $2\frac{1}{3}$lbs. of phosphate of lime).

Marls consist of carbonate of lime, generally resulting from the fragments of shells which have accumulated at the bottom of fresh water lakes, which have generally been filled up by clay or sand, or by the growth of peat. They contain from 1 to 2 per cent. of phosphate of lime, and at times small amounts of potash.

Marling only pays where the material is close at hand and can be put on the land at a cost of a few shillings a ton. An application of two to three tons to the acre is by no means excessive.

Gypsum, or hydrated calcium sulphate, has been much used as a manure, but as it occurs in superphosphate and is not charged for, is rarely applied to crops nowadays. It occurs in places crystallised, and is found very useful for leguminous plants, especially for red clover, lucerne, etc. Applied from two to six cwts. per acre. Supplies lime and sulphate to the crops and acts as a solvent, which sets potash free from its state of dormant combination in the soil. Appears to promote the process of nitrification. Is a valuable absorbent on the manure heap and in stables, cow sheds, and poultry yards, where it fixes the volatile ammonia into non-volatile sulphate of ammonia. Very useful in reclaiming alkaline salt patches containing carbonate of soda.

Ashes.—Supply in small quantities magnesium, potassium, calcium, iron, phosphorus and sulphur—all mineral matters necessary to the growth of plants, and for that reason they constitute a very good fertiliser. Besides their value as plant food, they also have on it a mechanical effect similar to that of lime. They are especially useful on light and sandy lands, rendering them moister. The value of ashes vary with the kind of wood burned, and with the care that has been taken of them. Limekiln ashes can at times be obtained at a reasonable price. They contain about 1 per cent. of potash and phosphoric acid and about 40 per cent. lime.

Green Manuring affords one of the best and cheapest methods of adding *humus* or organic mould to poor sandy soils more especially. The term is applied to some quick-growing crop which is ploughed in green. Two classes of plants are used: those which are not exacting in their demand for plant food and constitute a cover in the winter which checks loss by washing or drainage, and those which gather plant food from the air as well as from the subsoil and leave it on the surface for the use of succeeding crops. To the first class belong rye, buckwheat, rape, dandelion, Cape barley; to the second, the legumes—clovers, peas, vetches, lupins. By the process of green manuring, loose soils are made more retentive, and clay soils lighter. Cow peas, although very desirable as green manure, are not used in orchards where winter-growing plants are exclusively grown. For that purpose the most desirable plants are crimson clover (*Trifolium incarnatum*), an annual which germinates and develops quickly. Eight to ten pounds of seeds will

sow an acre. The growth of the crop will be greatly stimulated by the application of some phosphate and potash fertilisers. When grown, it will act in three distinct ways: as a winter covering to the soil, as a summer mulch, as a plant food gatherer. Experiments at the Jersey Experiment Station, U.S., found that a growth of 13 inches produced 168lbs. of nitrogen, worth £5.

The Canadian field pea has also given very satisfactory results. Sow about 85 to 100lbs. per acre, or plough the crop in the early spring, using a chain on the plough to cover and drag in all vines under the earth.

Green manuring may, under particular circumstances, be detrimental. In dry localities it may lead to the desiccation of the soil. It is calculated that one part of vegetable matter requires 300 to 500 times its own weight of moisture, so that every ton of green manuring crop in a dry locality would absorb 300 to 500 tons of water; and unless plentiful rain or abundance of artificial water can be relied upon, the process may in some cases be detrimental.

The results of commercial fertilisers are much more marked when applied on land well stocked with *humus* than when used on land depleted of vegetable mould.

Value of Fertilisers.

Under the Fertilisers and Feeding Stuffs Act it is imperative on the manure vendors to furnish with the invoice for any fertiliser sold a certificate showing the per cent. of nitrogen, phosphoric acid (soluble and insoluble), and potash contained in the manure. Mention of any other ingredient is of little or no value, and may be considered as so much padding, which is liable to confuse the purchaser. Failure to comply with this enactment may be meted out by a £20 fine. The more concentrated the fertiliser is, as regards any one or more of the three elements mentioned, the more valuable it is, so much less dead weight having to be handled and carried to the field.

The value of the three chief elements of a fertiliser—viz., nitrogen, phosphoric acid, and potash—is not uniformly the same, and is mostly influenced by sea and railway freight, and by its degree of solubility. The market quotation is expressed at so much a unit, the unit value being the value of one per cent. of the particular ingredient in a ton of manure.

Nitrogen in sulphate of ammonia or in nitrate of soda or of potash is worth in Western Australia 16s. to 18s. per unit; in Melbourne it is worth about 12s., and in Sydney a trifle under. In blood, bones, or offal (ground fine) it is worth 14s. to 15s. in this State, and about 10s. in the Eastern States.

If we express by 10 the worth of nitrogen in nitrate of soda, of potash, or of sulphate of ammonia and of ammonia in live guano, the nitrogen in blood and bones or meat is only worth 7, while in wool

waste, hair, horn, and leather it comes down to only 2 or 3, that is to say:—If an application of nitrogen under the form of nitrate of soda, or the substances grouped with it, would produce a surplus crop of 1,000lbs. of fruit, an equivalent amount of nitrogen derived from blood, bones, or meat would produce an increase of 700lbs., and a similar dressing of nitrogen from wool waste, hair, ground horn, or leather would only produce an increase of 200 to 300lbs. of fruit. It is thus seen how important in selecting the materials from which nitrogen, phosphoric acid, and potash are to be derived to see that the material is readily available.

Phosphoric acid varies greatly in value, whether it is soluble or insoluble in water. As regards "Citrate soluble" phosphoric acid—*i.e.*, from a phosphate soluble in a weak acid solution, such as one of ammonium citrate—the value is intermediate between the above two, thus: Water soluble phosphoric acid is worth in Western Australia 7s. and in the Eastern States 6s. a unit. Phosphoric acid insoluble in water is worth with us 3s. and in the East 2s. 6d. a unit, whilst citrate soluble phosphoric acid, worth here 5s., is valued in Sydney and Melbourne 4s. 6d. a unit.

Potash in soluble salts is worth in Western Australia 7s. and in the East 6s. a unit; while potash in natural manures, such as dried nightsoil, is worth 5s. and 4s. respectively. These prices, of course, fluctuate a little according to the state of the market, the quantity of fertilisers bought, and as to whether the transaction is a cash one or one involving terms.

To arrive at the value of a fertiliser, and unless it is specified whether the nitrogen, the phosphoric acid, and the potash are derived from the better prized material, these ingredients are considered as being derived from the baser ones when calculating values.

Knowing these values, it is easy, when furnished with an invoice certificate, to determine the real value of the manure offered. Thus a mixed fertiliser contains—

Nitrogen (or Sulphate of Ammonia) ...	4	per cent.
Phosphoric Acid—Water Sol....	5	"
" " Citrate Sol.	2	"
" " Insoluble	3	"
Total Phosphoric Acid	10	"
Potash or Muriate	4	"

This statement is treated as follows:—

	£	s.	d.
4 per cent. Nitrogen and Sulphate of Ammonia, at 16s.	3	4	0
5 per cent. Phosphoric Acid, soluble, at 7s.	1	15	0
2 " " Citrate, sol., at 5s. ...	0	10	0
3 " " Insol., at 3s.	0	9	0
4 " Potash, at 7s.	1	8	0
	£7	6	0

Or again—a bonedust contains 4·5 per cent. nitrogen and 20 per cent. phosphoric acid:—

	£	s.	d.
4·5 at 14s.	3	3	0
20 at 3s.	3	0	0
	£6	3	0

In this manure the purchaser can arrive at a fair value of the manure offered to him, to which, of course, must be added the cost of carriage from the manure works.

Effect of Fertilisers on Fruit Crops.

Experiments made a few years ago in the State of Missouri brought to light the fact that twigs, fruit spurs, spurs with fruit set of apples, analysed, showed that the much larger amount of lime, phosphoric acid, and potash in the bearing twigs is very marked as compared with non-bearing twigs. It would thus seem that the effect of fertilising fruit trees cannot possibly manifest itself in the same year in an increased fruit crop, but appears to a certainty the year after, and that fruit growers, in valuing fertilisers, must bear this in mind to arrive at a correct conclusion of the action of manures on their fruit crop.

Speaking in a broad sense, nitrogen, applied as a fertiliser, produces wood and leaves; phosphates produce fecundity; and potash produces sweetness and flavour; gypsum and sulphate of iron help to fix the fruit on the tree.

An abundance of nitrogen is indicated by rank growth and dark green foliage, and by size and coarseness of fruit. Conversely, stunted growth and pale leaves often show lack of nitrogen; fewer fruit are formed; these are of smaller size and colour early. On oranges, excessive organic nitrogen results in thick rind, abundant rag, and sometimes in causing die-back and gumming diseases.

Lime and potash correct the effect of heavy doses of organic nitrogen.

Mineral nitrogen stimulates the production of fruit more than excessive applications of organic nitrogen. In oranges, thinner skin and little rag or fruit pith is produced; sulphate of ammonia, when there is a slight deficiency of potash, tends to sweeten the fruit.

Phosphoric acid starvation is at times manifested by the appearance of the young and tender leaves, known as "frenching" or variegations of the foliage. It throws the tree into fruit quicker and has a most beneficial influence on the growth of the plant.

Potash fertilisers are not sufficiently used by fruit-growers, considering what an amount of this element is found in the ashes of fruit.

Heavy doses of potash, unless correspondingly accompanied by other fertilisers, produce sour fruit. Lack of potash is shown by spindly growth of wood, which summers badly and is easily injured

by frost. On account of its hygroscopic property, good results have been obtained in applying it in early spring to aid the plant in withstanding the spring drought, which often causes a great quantity of fruit to drop off.

Lime is notable in its effect on table grapes. It also tends to hasten the ripening and perfect the colouring of oranges. Deficiency of lime is often accompanied by thick skin and poor aroma.

When and how to Manure.

The question is often asked: When is it best to apply fertilisers? Phosphates may be applied at any time from the beginning of the autumn up till the end of the winter. Potash is better applied early in heavy soils, which it has a tendency to clog, so as to give to the winter rains and the frost time to counteract that characteristic. The application of lime with it will also correct this tendency. On light dry sandy loam it is advisable to apply potash fairly late, so as to utilise this hygroscopic feature towards storing up moisture in the vicinity of the roots of the plant.. Nitrogenous chemical fertilisers it is better to apply in the early spring amongst deciduous trees, and before the trees bloom. In regard to evergreen trees, such as those of the citrus tribe, it is immaterial at what time, so long as the trees are systematically and regularly fed. It is recommended for citrus trees to divide the amount of chemical nitrogenous manure to be applied during the year into two applications.

Experience will teach the orchardist how to regulate the spread of any quantity of the manure whilst covering an acre of land.

The following rule-of-thumb practice is found to be fairly correct for such fertilisers as potash, salts, and nitrate of soda, sulphate of ammonia, or any fertiliser of approximately the same weight.

In broadcasting, sowing a handful at each step, the right foot steps forward, and scattering it 12 to 15 feet in breadth, there will be applied 150 to 200 pounds per acre.

Non-soluble fertilisers, such as bonedust, it is preferable not to sow broadcast for the manuring of orchard or vineyards, as this practice draws the roots from underneath to the surface, where they are periodically hacked about by the tires of the scarifier. A better plan is to set the plough to its full depth of 9 to 10 inches and open a furrow up and down the centre of the land between the two rows of trees or vines and sowing in these deep gutters the amount of insoluble fertiliser it is meant to give to each acre of land. When this is done, the plough is again set to its proper depth and the earth is thrown back on to the manure, which is thus buried under. Should the land be too stiff, or the team too light for opening such deep furrows, the plough can be run once again in the bottom of a first top furrow, and the requisite depth is thus attained. In this manner numerous small rootlets issue from the severed roots of the

and coiling around each particle. When manure is forked into the ground, it should not be applied right against the bole of the tree, but a small distance away. The plate in the article on mulching illustrates the distribution of the main roots and of the rootlets in the ground. The first, whose main functions is to brace up and support the structure, are fairly barren of rootlets; they give rise to branch roots which, in their turn, carry towards their periphery the fibrous rootlets, which are in a true sense the feeding mouths of the plant, and absorb the moisture and food required by the growing tissues. The diagram shows where water and manure should be applied and where mulching does most good.

Experiment for Yourselves.

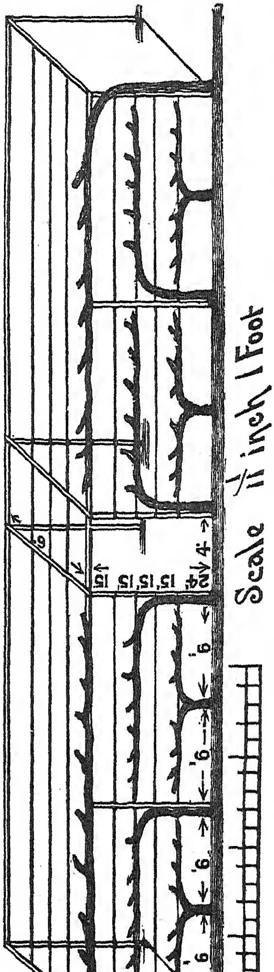
Chemical analysis of a soil will indicate on broad lines the wealth or the poorness of a given soil, but its teachings are in no wise as accurate as those derived from personal observation drawn from the result of local experiments. Growers can, with little or no trouble, find out for themselves the elements that are more urgently required by their trees. For this purpose, a row or two are set apart, every third tree is manured in some manner or other; the trees on each side of it are left unmanured, as witnesses to show by comparison whether a manured tree greatly differs from them or not. Some form of nitrogenous manure may be applied to one or more of the trees in the experimental line; then some form of phosphatic manure to one or more others; then again, some form of potassic manure to one or more trees. The experiment can further be widened by combining together for testing on some fresh trees any two of the manures used singly on the first lot of trees, and finally more trees are tested with a complete fertiliser, resulting from the combination of the three fertilisers used singly, or of any fertilisers containing in some available form the three elements—nitrogen, phosphoric acid, and potash.

One thing the grower must well penetrate his mind with, that crops, like animals, must be generously fed to keep healthy and bear abundant crops. Just as the digestive organs of the animal assimilate the nourishment of its body, so the assimilating organs of plants utilise the food placed within their reach. Like the animal also, they require a "complete ration;" that is to say, one with no needful element of plant food lacking, and when well fed the plant will thrive, produce without effort, and withstand and offer no encouragement to the numerous parasitic pests that assail our cultivated crops. Spraying and manuring operate conjointly, and well-fed trees, once freed from parasites, remain clean without further dressing for a very long time. The varying state of health and vigour in even a small 10-acre orchard, when the climatic conditions are otherwise alike, point out to variations in the constituents of the soil.

GARDEN TRELLISES.

By A. Despeissis.

Perhaps nowhere is the want of systematic training and pruning of the vine more glaringly exhibited than on the private garden trellises. There the vines are allowed to grow without restraint, and at pruning time canes are bent and directed in the most fanciful manner to fill a gap here and there. These vines, which are generally grown in close proximity to the house, as a rule receive more attention; they are manured, sulphured, the ground is dug round them, and as they bear well the owner takes little or no trouble in the first years of their growth to train them with some sort of method, until with years his mistakes are made apparent to him. The side buds are robbed by the higher ones, they get feebler and feebler, and at last cease to grow at all; the sides of the trellis become denuded, and all the energy of the vine is spent on the top. The sketch printed in these pages illustrates a method of training vines on the home trellis which, if copied, will result in the owner deriving from his vines both shelter and fruit. The sketch is drawn to scale, the vines planted six feet apart, and trained with one permanent arm only. On that arm, at intervals of 10 to 12 inches, spurs are left and cut back to two eyes, unless the vine shows a tendency of running riot, in which case one of the methods of pruning reviewed in a previous chapter on pruning, and preferably the modified Cazenave method, may be adopted. This method consists in leaving on the permanent arms one or several long rods supplied with five to ten eyes. These rods are bent down and tied; they carry much fruit and supply an outlet for any agressive



Seasonable Treatment for Insect and Fungus Diseases in the Orchard.

By G. Buchanan.

The winter months, while all deciduous trees are in a dormant condition, are particularly suitable for the treatment of trees for the eradication and prevention of disease. Not only is it possible, on account of the absence of foliage, to more effectually apply the various sprays, but the washes may with safety be used sufficiently strong to kill all kinds of scales and mites which may be wintering on the bark. The spores of fungoid diseases also remain dormant on the bark and in the buds, and these may be considerably checked by the application of strong washes, which could not be used with impunity during the period that the tree is putting forth leaves and making new wood. The application of the winter dressings should be deferred until the pruning has been completed, and prunings should be removed and destroyed by burning as soon as possible. Heaps of prunings lying around the boundaries of an orchard do not add to the appearance of the place, and are distinctly dangerous, for on them may be the eggs of injurious insects or the spores of fungus diseases that will awake to life with the warmth of the spring, and spread to trees in their vicinity. The orchardist should guard against every possible chance of distributing or harbouring disease, and will generally find it profitable to work on the principle that prevention is better than cure. Therefore the spraying of the orchard should not be delayed until insect or other pests have begun to seriously affect the trees, for once any disease gets a start in an orchard it is wonderful how difficult it is to effect its dislodgment. If an orchard is planted with healthy trees—and it is safe to assume that all the young trees supplied to local growers are at least free from insect diseases—it should be possible to keep the trees from becoming seriously infested by the application of strong winter washes, which can, if necessary, be followed with dressings of modified strength when the trees are in leaf.

There is no doubt that much of the want of success in spraying is due to want of thoroughness. Any intelligent individual can see from his own observation that scale insects can be killed by any of the mixtures recommended for use; yet it is quite a common thing to see trees, a few weeks after they have been treated, almost in as bad condition as they were before. In a great many cases this fact causes much dissatisfaction, and the orchardist is inclined to argue either that the mixture is worthless, or that it is outside the bounds of possibility to successfully cope with the disease. But if the spray kills a percentage of the insects it is only logical to infer that if it were applied to all in the same manner the results would be equal, therefore the operator should turn his attention to improving his methods of application. The writer has frequently seen orange trees twenty feet in height, and with a dense mass of foliage, being

sprayed with a small hand syringe or squirt, the operator walking round the tree and discharging the mixture in the air so that it would fall on the tree. The intention of the man treating his trees in this manner is no doubt commendable, but the result is practically *nil*, and spraying will never be satisfactory unless the work is thoroughly done, and, where necessary, persisted in until the desired result has been obtained. The first essential in the spraying of fruit trees is a good spray pump, and the implements generally in use in this State are miserably inadequate for the work. The knapsack arrangement is no doubt a most useful appliance for treating small trees, but where large trees with spreading branches have to be dealt with this class of tool is not equal to the work. The most suitable kind of implement is one which can be fixed to a cask and mounted on a cart or small trolly made for the purpose, so that it can be drawn about by horse-power. The pump should be supplied with two long lengths of hose, with delivery pipes of sufficient length to allow the operator to reach any part of the tree. With a pump of this kind, two rows of trees can be dealt with at the same time, the pump being drawn down the centre and a length of hose working on each side. Such an apparatus requires three men to work—one man to work the pump, and two men directing the spray nozzles. The great objection to the purchase of an outfit of sufficient capacity to thoroughly treat fully-grown trees is that of cost, as comparatively few of our fruit-growers possess a sufficient area of orchard to warrant the expenditure of from £10 to £20 in the purchase of spraying appliances, though the necessity of properly spraying a few trees is just as great as when a large number are grown in one place. This difficulty could, however, be overcome if the small growers in different districts would combine to purchase a complete apparatus and use it in turn, or one man might buy the machine and attend to the spraying of the small orchards. In fruit-growing districts a man with a good spraying outfit would probably find it profitable to undertake this class of work at certain seasons of the year, and the cost to the orchardists of small area would probably be less than if they did the work themselves, as the individual operating on a large scale could no doubt obtain his materials at less cost, and would have little or no waste, as the stuff over from the treatment of one place could be used at the next.

Before commencing to treat his trees, the orchardist should know exactly what he is going to spray for and what to use. The intelligent fruit-grower will note the condition of the fruit and foliage of his trees during the summer, which observation will guide him in the treatment to adopt in his winter spraying. If the leaves of his stone-fruit trees are affected with shot-hole or rust, or his apples and pears show signs of scab, it will be found useless to apply washes such as kerosene emulsion or Paris green, though these mixtures will be found valuable for scale insects and leaf-eating insects respectively. The Paris green, however, will not be found suitable for winter application. Assuming that the orchardist has not, or is unaware of any serious insect or fungoid pests affecting

his trees, and is anxious to maintain them in a clean and healthy condition, the mixture known as lime, sulphur, and salt-wash will be found to be of great value in accomplishing this end, as the mixture not only destroys insects and their eggs, but also has a good effect in checking fungoid diseases. For the eradication of scale insects from deciduous trees in the winter this wash will be found second to none, though it should be carefully borne in mind that the success of this spray largely depends on the freshness of the lime used in its manufacture. In all mixtures for application to fruit trees, of which lime is an ingredient, care should be taken to have only the freshly-slaked article.

The treatment of trees known to be affected with fungus diseases, such as scab, curl leaf, shot-hole, leaf rust, etc., should be with the Bordeaux mixture, the ingredients of which are bluestone, lime, and water. The application of this mixture is most effective when applied immediately before the buds begin to burst, and if necessary further dressings of half the full strength can be made after the foliage is out.

To secure the best results from winter spraying, the operator will have to exercise judgment in choosing suitable weather for the work, for if the application is made during rainy weather the mixture will be washed off before it has accomplished its work. Strong winds are also detrimental to effective spraying, as the application should be made in the form of a fine mist, which will be blown away and quickly evaporated if applied during stormy weather. When it comes to the actual work of spraying, the operator should bear in mind that every part of the tree must receive its fair share of the mixture if the best results of his labour are to be obtained. The fineness of the spray applied also contributes largely to the success of the operation. The finer the spray the better will the wash adhere to the tree; in addition to which, a fine spray will distribute the material more evenly and economically than a coarse nozzle which emits a solid volume of liquid that begins to course down the limbs and trunk of the tree immediately it strikes, thereby wasting material and carrying to the ground the mixture which should adhere to the tree.

It should be distinctly understood that the foregoing remarks refer particularly to the treatment of deciduous and dormant trees. The spraying of citrus trees for scale diseases will be found more effective if deferred until the warmer weather, when the young insects are leaving the protection of the parent scales. The trees themselves are also in a better condition for treatment at that time, as the fruit will have set and the growth will be less tender and not likely to be in any degree damaged by the application of insecticides.

FUNGI DISEASE.

The following proclamation has been issued by the Victorian Government, dealing with insects and fungi diseases under the Vegetation Diseases Act, 1896, of that State:—

VEGETATION DISEASES ACTS, 1896 AND 1901.

INSECTS AND FUNGI.

PROCLAMATION.

By His Excellency Sir George Sydenham Clarke, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George; Fellow of the Royal Society; Governor of the State of Victoria and its Dependencies in the Commonwealth of Australia, etc., etc., etc.

IN pursuance of the provisions contained in the Vegetation Diseases Act, 1896 (59 Vict., No. 1432), and the Vegetation Diseases Act, 1901 (1 Edw. VII., No. 1773), I, the Governor of the State of Victoria, by and with the advice of the Executive Council thereof, do by this my Proclamation declare certain insects named respectively as hereunder, that is to say:—

Acarid ("Maori" on Citrus Fruits),
Aspidiotus Rossi (Black flat Scale),
Aspidiotus Coccineus (Red or Orange Scale),
Aspidiotus perniciosus (San José Scale),
Caecœcia responsana (Light Brown Apple Moth),
Carpocapsa pomonella (Codlin Moth),
Chionaspis Citri (White Scale of Orange),
Chionaspis eugeniœ (White Mussel Scale),
Halterophora Capitata (European Fruit Fly),
Leptops Hopei (Apple-root Borer),
Lecanium Oleœ (Olive Scale),
Mytilaspis pomorum (Apple-bark or Mussel Scale),
Mytilaspis Citricola (Lemon Leaf and Peel Scale),
Myzus Cerasi (Black Peach Aphis),
Phylloxera Vastatrix (Vine Louse),
Selandria Cerasi (Pear Slug),
Tephritis Tryoni (Australian Fruit Fly),

to be insects within the meaning of the said Acts; and certain fungi named respectively as hereunder, that is to say:—

Fusicladium dendriticum (Apple Scab),
Fusicladium pyrinum (Pear Scab),
Phyllosticta Circumscissa (Shot-hole of Apricot),
Exoascus deformans (Leaf Curl of the Peach),
Phoma Citricarpa (Anthracnose or Black Spot of the Orange and Lemon),
Cladosporium Carpophilum (Peach Freckle),
Puccinia Pruni (Prune Rust),
"*Melanose*,"
"*Bitter Pit*,"

to be fungi within the meaning of the said Acts.

Given under my hand and the Seal of the State of Victoria aforesaid, at Melbourne, this twenty-sixth day of May, in the year of Our Lord One thousand nine hundred and two, and in the second year of His Majesty's reign.

G. S. CLARKE.

By His Excellency's Command,

JOHN MORRISSEY,
Minister of Agriculture.

GOD SAVE THE KING! ! !

MARKET REPORT.

The West Australian Farmers' Co-operative Company, Limited, City Markets, Perth, report as follows :—

Markets have remained firm for all local produce during past month. The demand for chaff and hay has been very brisk, and satisfactory prices have been obtained for all lines submitted. Local potatoes have met with first-class demand, and high prices obtained for all prime local lots. There have been heavy sales of carcase pork and live pigs; very satisfactory prices have been obtained for same. Under-mentioned are range of prices obtained:—

Farm Produce.—Chaff market bare, prices realised £5 5s. to £5 15s. for all prime lines; inferior and medium quality, £4 5s. to £4 15s. per ton. Straw chaff, £3 10s. per ton. Hay, suitable for bullock feed, wanted at full market rates. Wheat: Full rates still obtained, 5s. 6d. to 5s. 9d. per bushel; cracked wheat, 5s. per bushel. Oats: Algerian, 4s. 2d. to 4s. 6d. per bushel; New Zealand stout oats, 4s. 8d. to 4s. 9d. per bushel. Flour: Local brands, £11 to £11 5s.; imported flour, £12 to £12 10s. per ton. Potatoes: Market has improved considerably; prime local potatoes worth £11 to £11 5s. per ton. Imported potatoes have been arriving in bad order lately, worth £8 to £9 10s. per ton; seed potatoes, selling freely, £10 to £11 per ton. Onions: Market very dull, £8 to £10 per ton. Straw, £2 10s. to £3 per ton.

Dairy Produce.—No local butter offering. New Zealand butter, 1s. 4d. to 1s. 5½d. per lb. Hams, 1s. 2d. to 1s. 3d. per lb. Cheese, 9½d. to 10d. per lb. Bacon, 11d. to 11½d. per lb. Honey, 60lb. tins, 13s. 6d. to 15s.; 14lb. tins, 4s. each; 4lb. tins, 16s. per dozen. Eggs, increased supplies all reliable lines, 2s. per dozen.

Fruit.—Local oranges selling better, 8s. to 11s. per case; lemons, 6s. to 6s. 6d. per case; mandarins, 12s. to 14s. per case; bananas, 10s. to 16s. per case.

Vegetables.—Cabbage still very plentiful, 2s. to 5s. per cwt; cauliflowers, 3s. to 6s. per dozen; pumpkins, £5 10s. to £6 10s. per ton; Swedish turnips, £5 to £6 per ton; bunch root vegetables, 1s. 9d. to 2s. per dozen; salads, 9d. to 1s. per dozen; celery, 2s. 6d, to 2s. 9d. per dozen; beet root, 2s. 6d. to 3s. per dozen.

Poultry.—The price of this line is improving. Prime table fowls, 6s. to 6s. 9d. per pair; chickens, 4s. 6d. to 5s. 6d. per pair; pure bred fowls, 10s. to 20s. per pair; ducks, scarce, 9s. to 10s. per pair; geese, 12s. to 15s. per pair; turkey gobblers, 18s. to 22s. per pair; turkey hens, 10s. to 12s. per pair.

Live Stock and Carcase Meat.—Pigs, splendid demand for all prime lines forward, at increased prices. Prime porkers, 30s. to 36s. each; stores in forward condition, 20s. to 28s. each; backward stores, 12s. to 15s. each; suckers and weaners, 8s. to 10s. 6d. each. Sheep, 20s. to 30s. each. Prime carcase pork, 7d. to 7½d. per lb.; heavy weight pork, 4½d. to 6d. per lb. Beef, 5½d. to 6d. per lb. Mutton, 5½d. to 6d. per lb.

GARDEN NOTES FOR AUGUST.

By Percy G. Wicken.

By the time these notes appear in the journal the winter will be almost a thing of the past, and present indications point to it being a very dry one, and this, in conjunction with the droughts experienced in the Eastern States, shou'd indicate high prices for produce during the coming summer. In the warmer parts of the State, spring may be said to start at the end of this month, but in the more Southern portions frosts are still likely to be experienced. Preparations should now be made whenever an opportunity occurs to get the ground in order for sowing the spring crops as early as possible. Land intended for sowing vegetables should be kept free from all weeds, and a good dressing of well rotted stable manure dug in the ground. Care should also be taken in sowing seeds, that a rotation of crops is kept: for instance, peas should not follow after peas, or turnips after a root crop, but by growing one variety one year and a different crop another year, the crops are kept healthy, and many forms of disease are kept in check. When planting out seeds, the surface soil should be worked up as fine as possible and kept perfectly level, this enables the young seedlings to obtain a good root hold of the soil. Most plants can be grown in a seed bed and transplanted out into the garden, and this is the most economical way to plant out and saves a large quantity of seed.

Asparagus is a vegetable very little grown in this State, and one that should prove a welcome addition to our list of table delicacies. The roots should be planted as soon as possible, because in the warmer districts they will begin to shoot out. Asparagus prefers a light, warm soil. A dressing of dung should be well mixed with the surface soil to a depth of 6 inches. When the ground is ready for planting, dig holes about 6 inches deep, and large enough for the roots to be spread out evenly without touching the sides. Keep the centre of the plant an inch or two higher than the roots. This can be done by raising the soil in the centre of the hole, making a little sort of mound, as it were. Fill in with fine soil by hand and press it firmly down, being careful not to injure the roots. The crown of the plant should be about 2 inches below the surface when covered up. The plants should be from $2\frac{1}{2}$ feet to 3 feet apart. If roots cannot be obtained, the grower will have to raise his own roots from seed, and the sowing had better be done in September or October.

Artichokes (Jerusalem).—These are a very useful plant to have growing; they make a welcome addition to the table, and are also valuable for feeding to pigs. They should be planted much in the same way as potatoes, in rows 3 feet apart and $1\frac{1}{2}$ feet apart in the rows. They will grow in almost any kind of soil, and are of the same family as the sunflower, and the leaf and flower is very similar to that of the sunflower.

Beans (French or Kidney).—This is a very popular vegetable, and can now be sown in small quantities in districts where there is no danger of frosts.

Beet (Red).—Sow in drills about 18 inches apart, and cover the seed about one inch deep. Thin out to 16 inches apart as the plants make a good growth.

Beet (Silver).—The leaf and not the root of this plant is used for food. Plant and treat the same as for red beet.

Cabbage.—Plant out those that are fit from the seed beds, taking care to lift the roots carefully so that they do not get damaged or broken. Make seed beds for future use.

Carrot.—Sow in land that has been well cleaned of weeds, as the carrot is a slow grower and the weeds are likely to choke it out. Do not apply fresh manure to this crop, but sow in land that has been well manured for the previous crop.

Cucumber.—Sow seed under shelter, and at end of the month in the open. Those planted in the open will require to be sheltered at night.

Onions.—Sow freely of this wholesome vegetable in well drained land, and supply freely with good farmyard manure. They may either be planted in drills and thinned out or sown in a seed bed and transplanted.

Peas.—Sow freely in well-prepared land, and avoid manures containing nitrogen, such as nitrate of soda, sulphate of ammonia, blood manure, etc., and use manures containing potash, phosphoric acid, and lime. Plant in rows about 3 feet apart, according to variety, and about 6 inches apart in the rows. Put sticks along the rows as soon as the peas are a few inches high.

Potatoes.—Plant out the Kidney or Early Rose varieties in all the warmer localities; plant in rows 3 feet apart, and about 16 inches apart in the rows. Use good healthy-looking seed potatoes of medium size, and free from scab, potato moth, etc.

Sweet Potatoes.—Make a seed bed, and place tubers in the seed bed, as described on page 76 of August number of the *Journal* for last year, so as to have a good supply of cuttings to put out later on.

Tomatoes.—Sow in sheltered places well protected from frost in the warmer localities, and in the cooler parts in frames or boxes, so that the young plants can be covered at night.

Farm.—The wheat crops should now be well forward; where too much growth has not been made, the crop may be harrowed and rolled; this improves the growth of the crop and leaves the ground in good order for the harvesting. In the warmer districts of the State the early varieties of potatoes may be sown. Mangolds and sugar beet, if not already sown, should be put in as soon as possible; they require a deeply worked soil, are gross feeders, and require a liberal supply of manure; they are both of considerable

value for feed for stock, and possess good fattening properties. An article on the cultivation of sugar beet is published in this issue of the Journal. Another crop that can be sown during this month to advantage is Hungarian millet; this crop is not grown to anything like the extent it should be. It is a very quick growing crop, and can be used either for green feed, hay, or grain, and is very useful for feeding sheep. If cut for hay, it should be cut while the ears are green, as, if left too long, the little awns on the ears become hard, and have an injurious effect on the intestines of the animals eating them. Lucerne can still be sown, but the ground requires to be brought to a fine tilth, and to be free from weeds. Buck-wheat is another crop that can be sown at the present time; it is very good feed for stock; it remains in flower for a long period, and is very valuable where bees are kept, and increases the flow of honey, but is not a heavy yielder as a forage plant. It is also a good time to plant out seeds and roots of the golden crown grass (*Paspalum Dilatatum*), and also of the *Paspalum Virgatum*, and other summer grasses.

ANSWERS TO CORRESPONDENTS.

WHITE ANTS IN ORCHARDS.—Mr. G. Burgess, Kalgoorlie, writes:—"We are troubled a great deal with white ants in this district. I am desirous of planting orange and lemon trees on my land, but owing to this pest, I am hesitating until I get some advice on the matter." The matter being referred to the horticultural and viticultural expert, Mr. Despeissis replies:—"The problem is by no means an easy one to solve, as everything that would effectually kill the white ants around evergreen trees such as citrus trees would endanger these plants. Where vines and deciduous trees are concerned, it is possible, when they are dormant, to inject into the ground some substance such as Carbon bi-sulphide which, by diffusing its vapours into the ground, would destroy all animal life within the reach of its action. Carbon bi-sulphide could be poured into holes made with a crowbar, one to every square yard, around the trees, and the hole plugged after the application. That chemical is often mixed with half its weight of kerosene oil to make its effect more lasting; ¼oz. to the hole is sufficient."

HATCHING GOOSE EGGS.—Mr. M. Morgan, of Northam, writes:—"Would you kindly inform me the correct degree to hatch goose eggs in an incubator?" The Dairy and Poultry Expert to the Department having been transferred to Northampton, your query was forwarded to the Stock Department. In reply, Mr. Norman Malcolm says:—"The temperature generally recognised as correct for hatching geese in an incubator is 104 degrees. It is always advisable, however, to take advantage of experience gained under local conditions, and this teaches that excellent results are obtained with a temperature of 102 degrees. In adopting artificial means of fowl production, nature should be copied as closely as possible; and, in this connection, it has been found advisable to expose the eggs to the atmosphere for twenty minutes every night and morning, which represents the time a bird will usually vacate her nest. In the case of water-fowl, some breeders sprinkle the eggs night and morning with water, when hatching by incubators."

THE CLIMATE OF WESTERN AUSTRALIA DURING JUNE, 1902.

On the whole the weather was very enjoyable. Moderate storms of the usual winter type passed along the South coast on the 1st-2nd, 11th-12th, and 25th-26th, and the heaviest of the season had just reached Cape Leeuwin at the end of the month. In addition there was a good downpour throughout the interior on the 4th and 5th.

This came unannounced, but was followed by the passage of a very moderate "low," which appeared off the central West coast on the 5th, passed overland to the Bight and continued its course as an ordinary winter "low," still, however, preceded by heavy rains extending well North, and breaking up the drought from which South Australia had been so long suffering.

The rainfall on the whole was considerably below the average on the West and South-West coast and for about 200 miles inland. Elsewhere it was about normal.

Barometric pressure was high throughout the State, especially on the Coolgardie Goldfields.

The day temperature was generally above the average for previous years, except on the West coast, and the night temperature was lower than usual. Frosts have been experienced inland, and the following table shows the average and lowest temperatures registered by a minimum thermometer placed on the surface of the ground :—

TERRESTRIAL MINIMUM TEMPERATURE.

Station.	Mean.	Lowest.	Date.
Cue	38·3	27·0	20
Coolgardie	37·1	29·9	27
Southern Cross	33·0	24·0	18
Walebing	35·2	26·0	18
York	35·3	28·2	11
Perth Observatory	42·4	33·4	18
Bridgetown	35·9	27·0	15
Karridale	42·3	33·5	21
Katanning	33·6	28·0	4, 14, 28

The Climate of Western Australia during June, 1902.

Locality.	Barometer (corrected and reduced to sea level). Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. June, 1902. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	30·022	29·989	30·130	29·853	89·5	67·8	78·6	92·8	54·2	89·1	67·7	113·0	52·0	15	2167
Derby	30·017	30·004	30·179	29·876	88·4	58·9	73·6	93·2	52·0	85·4	60·8	99·0	48·0	30	1477
Broome ...	30·033	30·009	30·183	29·880	83·8	60·5	72·2	93·0	53·0	81·8	58·3	96·9	39·0	160	2213
Condon ...	30·076	30·040	30·234	29·897	79·2	50·3	64·8	87·0	38·8	76·4	53·8	94·0	39·2	55	2074
Cossack ...	30·113	30·034	30·281	29·894	78·0	55·6	66·8	89·1	47·8	75·8	59·2	95·0	44·9	17	1297
Onslow ...	30·084	30·072	30.249	...	78·8	51·6	65·2	87·0	44·2	77·0	52 6	94·0	38·5	38	376
Carnarvon ...	30·121	30·046	30·285	29·886	74·0	50·7	62·4	83·5	43·2	77·1	52·3	90·0	38·0	293	732
Hamelin Pool...	30·142	30·061	30·730	29·978	71 0	49·0	60·0	76·6	37·6	69·1	52·2	79·8	36·2	66	346
Geraldton ...	30·158	30·097	30·392	29·819	69·4	50·4	59·9	78·6	42·0	68·7	52·0	84·0	35·0	234	753
INLAND:															
Hall's Creek ...	30·116	...	30·343	29·903	81·3	48·1	64·7	87·2	39·0	80·6	53·2	89·5	33·1	*Nil*	1387
Marble Bar ...	...	...	...	...	81·4	52·5	67·0	92·0	40·5	...	...	...	...	44	1165
Nullagine ...	30·142	...	30·361	29·840	76·3	46·3	61·3	89·8	33·0	73·4	49·4	86·2	32·8	51	1265
Peak Hill ...	30·194	30·092	30·436	29·882	66·9	45·9	56·4	75·7	37·7	65·1	47·9	75·2	38·4	94	1776
Wiluna ...	...	...	...	...	65·4	40·3	52·8	76·7	31·2	...	...	...	...	133	1204
Cue	30·195	30·096	30·479	29·840	68·6	43·2	55·9	78·1	34·8	64·4	47·3	77·0	34·0	39	723
Yalgoo ...	30·183	30·082	30·457	29·871	67·5	32·5	55·0	79·8	33·0	64·3	46·6	75·0	33·8	22	395
Lawlers ...	30·260	30·096	30·477	29·903	63·9	43·2	53·6	75·0	33·4	62·6	47·4	76·2	34·4	182	878
Laverton ...	30·210	...	30·484	29·753	64·5	42·2	53·4	78·1	38·3	...	...	...	...	208	850
Menzies ...	30·220	30·092	30·573	29·850	63·0	43·3	53·2	75·9	32·8	61·9	45·4	74·0	33·8	96	853
Kalgoorlie ...	30·192	30·078	30·577	29·858	62·6	44·5	53·6	76·2	34·0	61·2	45·9	76·4	34·0	33	606
Coolgardie ...	30·210	30·078	30·558	29·824	62·2	43·4	52·8	78·4	35·3	61·1	42·2	74·0	31·5	135	619
Southern Cross	30·182	30·098	30·477	29·762	63·8	37·6	50·7	77·5	26·5	62·4	42·6	79·0	28·0	128	611
Walebing ...	...	...	...	...	63·8	40·2	52·0	73·6	30·0	...	...	...	...	212	414
Northam ...	...	...	...	...	65·1	36·6	50·8	74·C	29·4	...	...	...	...	*111*	294
York	30·196	30·095	30·468	29·728	64·0	37·6	50·8	73·5	30·8	61·6	42·8	80·0	28·0	166	345
Guildford ...	...	...	...	...	65·5	42·7	54·1	72·0	34·8	...	...	...	...	305	868

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during June, 1902—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					June, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens	30·179	30·090	30·441	29·630	63·9	46·3	55·1	70·6	39·6	64·7	47·3	81·0	31·2	357	872
Perth Observatory	30·192	30·040	30·452	29·718	63·7	46·9	55·3	69·7	39·9	63·1	49·2	63·2	36·9	366	877
Fremantle ...	30·154	30·070	30·424	29·706	63·6	50·7	57·2	69·0	43·5	63·6	50·8	82·0	38·0	328	810
Rottnest ...	30·168	30·033	30·406	29·689	63·2	54·3	58·8	69·0	44·6	64·0	51·9	77·0	40·5	433	842
Mandurah ...	...	...	...	...	64·0	44·1	54·0	70·0	34·0	...	...	...	...	365	1075
Wandering ...	...	...	...	...	61·5	34·4	48·0	70·0	28·8	...	...	..	...	216	560
Collie	...	...	...	...	60·9	34·8	47·8	67·0	28·8	...	...	...	...	291	905
Donnybrook ...	...	...	...	...	62·0	39·8	50·9	67·1	32·1	...	...	...	...	423	1139
Bunbury ...	30·070	30·066	30·434	29·609	62·9	45·8	54·4	69·0	35·8	63·2	47·7	80·0	34·0	416	1061
Busselton ...	...	...	...	...	62·3	44·9	53·6	68·5	35·5	...	...	...	...	427	956
Bridgetown ...	...	...	...	...	61·0	37·5	49·2	68·0	28·7	...	...	...	...	290	1077
Karridale ...	30·141	29·996	30·423	29·580	62·4	49·1	55·8	68·8	38·2	62·2	47·8	76·0	31·8	711	1768
Cape Leeuwin	30·102	29·939	30·431	29·461	62·5	53·8	58·2	68·0	48·8	62·1	53·2	70·2	46·4	378	1151
Katanning ...	30·174	30·004	30·486	29·658	60·1	41·2	50·6	70·8	34·0	59·6	42·3	71·5	29·5	149	439
Albany ...	30·150	30·051	30·485	29·550	62·3	45·2	53·8	72·8	36·5	59·8	47·1	79·0	34·0	488	1636
Breaksea ...	30·138	29·971	30·496	29·503	60·0	51·1	55·6	72·8	45·0	59·9	50·7	71·0	41·0	309	1140
Esperance ...	30·149	30·086	30·539	29·719	64·2	47·8	56·0	77·2	39·0	62·9	46·5	77·0	33·0	400	1217
Balladonia ...	30·153	...	30·550	29·764	62·2	42·9	52·6	72·4	32·0	...	...	...	...	76	595
Eyre	30·166	...	30·630	29·810	64·1	46·7	55·4	78·7	31·0	...	...	...	...	349	821

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
9th July, 1902.

W. E. COOKE,
Government Astronomer.

RAINFALL for May, 1902 (completed as far as possible), and for June, 1902 (principally from Telegraphic Reports).

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham	Nil	...	15	1
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek	Nil	...	4	1
Plympton, St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	Nil	...	Nil	...
Flora Valley	...	...	...	...
Ruby Creek	...	...	...	...
Ruby Plains	Nil	...	...	...
Denison Downs	Nil	...	...	...
West Kimberley:				
Beagle Bay	25	1	...	...
Obagama	Nil	...	...	...
Derby	Nil	...	30	1
Yeeda	...	...	...	...
Liveringa	...	...	...	...
Mt. Anderson	Nil	...	...	...
Leopold Downs	...	...	...	...
Fitzroy Crossing	Nil	...	4	2
Fitzroy (C. Blythe)	...	...	...	...
Quanbun	...	...	...	...
Nookanbah	...	...	...	...
Broome	5	1	160	1
Roebuck Downs	...	...	...	...
Thangoo	Nil	...	...	...
La Grange Bay	1	1	187	1
North-West:				
Wallal	Nil	...	153	1
Condon	39	5	55	2
De Grey River	...	...	...	...
Port Hedland	9	3	76	2
Boodarie	Nil	...	...	...
Yule River	...	...	...	...
Warralong	Nil	...	...	...
Muccan	...	...	...	...
Ettrick	12	2	...	...
Mulgie	...	...	...	...
Eel Creek	...	...	...	...
Pilbarra	Nil	...	Nil	...

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
North-West—*cont.*				
Coongon	...	...	...	...
Warrawagine	...	...	...	...
Braeside	...	...	...	...
Bamboo Creek	6	2	46	1
Marble Bar	13	2	44	1
Warrawoona	14	3	58	1
Corunna Downs	Nil	...	...	...
Nullagine	20	...	51	2
Yandicoogina	...	...	...	...
Kerdiadary	...	...	...	...
Roy Hill	78	1	...	...
Mosquito Creek	...	...	...	...
Mulga Downs	...	...	...	...
Woodstock	...	...	...	...
Mt. Florence	119	2	...	...
Tambrey	...	...	...	...
Millstream	77	1	...	...
Yandyarra	...	...	...	...
Mallina	...	...	...	...
Whim Creek	16	1	Nil	...
Cooyapooya	66	1	...	...
Woodbrooke	...	...	...	...
Croydon	62	1	...	...
Balla Balla	9	1	4	1
Roebourne	31	1	24	2
Cossack	30	1	17	2
Fortescue	40	1	...	...
Mardie	15	1	...	...
Mt. Stewart	...	...	...	...
Yarraloola	...	...	...	...
Chinginarra	Nil	...	...	...
Onslow	26	3	38	2
Peedamullah	35	1	...	...
Red Hill	Nil	...	...	...
Mt. Mortimer	45	4	...	...
Wogoola	102	5	...	...
Nanutarra	...	...	...	...
Yanrey	...	...	...	...
Point Cloates	59	...	...	...
Gascoyne:				
Winning Pool	302	4	290	3
Towara	...	...	...	...
Ullawarra	110	3	...	...
Maroonah	...	...	...	...
Thomas Police Station	...	...	...	...

RAINFALL—*continued.*

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...
Gifford Creek ...	172	2	...	...
Minnie Creek ...	92	4	...	...
Yanyeareddy ...	75	2	...	...
Williambury ...	51	3	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	30	5	...	...
Boolathana ...	...	...	...	...
Carnarvon ...	23	4	293	5
Cooralya	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	115	4	...	...
Clifton Downs ...	117	4	...	...
Dairy Creek ...	...	...	...	...
Mt. Clere ...	...	...	...	...
Errivilla	98	4	...	...
Dirk Hartog Island	237	16	...	...
Sharks Bay ...	153	...	135	2
Kararang ...	316	12	...	...
Meedo	44	5	...	...
Tamala	...	...	...	...
Wooramel ...	23	3	105	3
Hamelin Pool ...	168	7	66	4
Byro	88	4	32	1
Yarra Yarra ...	...	...	46	2
Berringarra ...	44	4	27	2
Mt. Gould ...	92	3	...	...
Moorarie	67	3	...	...
Wandary... ...	150	5	48	4
Peak Hill ...	223	4	94	4
Horseshoe ...	274	5	97	3
Abbotts	52	5	56	2
Belele	89	4	...	...
Mileura	96	5	...	...
Milly Milly ...	49	3	...	...
Manfred	30	3	36	1
Meelya	21	3	...	...
Woogorong ...	...	...	...	...
Boolardy	...	...	...	...
Billabalong ...	28	3	41	1
Wooleane ...	105	4	45	1
Murgoo	36	1	...	...
Meeka	64	5	58	2
Mt. Wittenoom ...	39	5	58	2
Nannine	115	5	52	3
Star of the East...	112	5	50	3
Annean	46	2	...	...

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Tuckanarra ...	66	5	25	2
Coodardy ...	20	2	Nil	...
Cue	62	5	39	3
Day Dawn ...	11	1	19	1
Lake Austin ...	31	3	45	1
Lennonville ...	40	3	29	2
Mt. Magnet ...	45	4	7	1
Warracoothara...	83	5	...	...
Challa	51	3	22	1
Youeragabbie ...	...	...	...	...
Murrum	38	1	Nil	...
Burnerbinmah ...	40	3	...	...
Yalgoo	30	3	22	2
Gabyon	73	4	45	2
Barnong	21	3	46	2
Gullewa	43	5	...	...
South-West Division (Northern Part):				
Murchison House	284	13	...	...
Mt. View ...	159	7	132	5
Yuin	67	3	25	2
Northampton ...	243	10	202	5
Mt. Erin ...	237	11	...	...
Oakabella ...	336	9	...	...
Narra Tarra ...	276	7	...	...
Tibradden ...	254	7	...	...
Sand Springs ...	235	11	102	6
Mullewa... ...	138	7	71	5
Kockatea ...	107	5	46	3
Bootenal ...	282	6	155	5
Geraldton ...	474	13	234	8
Greenough ...	323	9	...	...
Dongara ...	454	7	89	4
Dongara (Pearse)	452	9	138	5
Strawberry ...	144	8	81	2
Mingenew ...	113	12	91	6
Rothesay ...	...	...	...	...
Field's Find ...	...	...	...	...
Carnamah ...	150	11	83	6
Watheroo ...	232	8	121	9
Dandaragan ...	356	13	211	9
Moora	226	12	175	7
Yatheroo ...	362	14	213	8
Walebing ...	184	14	212	7
New Norcia ...	368	14	174	9

RAINFALL—*continued.*

Stations.	May. No. of points. 100 = 1in.	May. No. of wet days.	June. No. of points. 100 = 1in.	June. No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	487	14	331	9
Belvoir	501	15	351	10
Mundaring ...	485	16	367	10
Guildford ...	515	16	305	10
Kalbyamba ...	517	16	348	10
Canning W't'r'w'ks	699	15	415	10
Perth Gardens ...	475	17	357	10
Perth Observatory	489	17	366	10
Subiaco	581	17	422	10
Claremont ...	589	17	322	8
Claremont (Richardson)	...	...	...	...
Fremantle ...	443	15	328	11
Rottnest	369	15	433	11
Armadale ...	464	12	332	10
Rockingham ...	562	14	485	10
Canning River ...	598	16	562	9
Jarrahdale ...	734	14	497	7
Mandurah ...	662	17	365	12
Pinjarra	691	16	342	12
Yarloop	...	...	495	11
Harvey	687	19	530	12
South-West, Central Part (Inland):				
Hatherley ...	236	11	...	...
Momberkine ...	184	11	101	3
Mouglin ...	260	12	121	7
Culham	263	14	152	6
Newcastle ...	249	11	179	10
Eumalga ...	265	14	172	8
Northam ...	144	10	111	5
Grass Valley ...	174	9	113	5
Meckering ...	211	9	104	4
Cunderdin ...	...	...	...	...
Doongin	145	7	82	2
Whitehaven ...	149	4	105	3
Sunset Hills ...	163	9	122	4
Cobham	219	13	132	7
York	181	13	166	7
Beverley ...	132	10	170	7
Barrington ...	142	9	177	6
Sunning Hill ...	172	9	108	6
Wandering ...	322	16	216	9
Pingelly ...	213	12	101	...
Marradong ...	375	13	267	7

Stations.	May. No. of points. 100 = 1in.	May. No. of wet days.	June. No. of points. 100 = 1in.	June. No. of wet days.
South-West—*contd.*				
Bannister ...	388	15	211	10
Narrogin ...	187	11	156	8
Wickepin ...	158	12	...	...
Gillimaning ...	...	...	85	4
South-West Division (Southern Part):				
Bunbury ...	587	20	416	11
Collie	546	20	291	12
Salvation Army Settlement	513	16	...	...
Glen Mervyn ...	662	15	498	12
Dardanup ...	533	14	367	9
Donnybrook ...	611	20	423	12
Boyanup ...	701	19	402	13
Busselton ...	468	19	427	18
Margaret River	460	10	...	...
Lower Blackwood	905	19	480	13
Karridale ...	818	21	711	26
Augusta ...	629	20	429	22
Cape Leeuwin ...	601	24	378	24
The Warren ...	956	15	...	...
Lake Muir ...	549	19	256	14
Mordalup ...	415	18	251	14
Deeside	543	19	274	16
Riverside ...	620	18	...	...
Balbarup ...	558	19	331	17
Wilgarup ...	584	20	353	16
Mandalup ...	539	15	377	14
Bridgetown ...	711	20	290	18
Greenbushes ...	580	15	374	12
Greenfield ...	...	...	312	10
Glenrichy ...	355	10	269	6
Williams ...	394	14	174	9
Arthur	340	16	...	...
Darkan	219	12	219	9
Wagin	262	16	117	9
Glencove ...	231	13	133	9
Dyliabing ...	254	13	106	9
Katanning ...	266	14	149	10
Kojonup ...	295	18	197	10
Broomehill ...	272	17	112	11
Sunnyside ...	297	12	111	9
Woodyarrup ...	239	13	128	12
Cranbrook ...	293	12	172	10
Blackwattle ...	442	15	...	...
Mt. Barker ...	348	18	339	18
Kendenup ...	465	17	287	17

RAINFALL—*continued.*

Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.	Stations.	April. No. of points. 100 = 1in.	April. No. of wet days.	May. No. of points. 100 = 1in.	May. No. of wet days.
SOUTH-WEST—*contd*					EASTERN—*contd.*				
St. Werburgh's...	528	16	...	...	Burbanks P.O. ...	190	6	170	4
Forest Hill ...	629	20	358	19	Burbanks Birth-day Gift	193	5	173	2
Denmark ...	968	...	338	15					
Albany	955	18	488	19	Woolubar ...	201	4	...	...
Point King ...	990	14	471	16	Widgiemooltha...	202	5	198	6
Breaksea ...	652	15	309	20	50-Mile Tank ...	73	5	100	5
Wattle Hill ...	...	...	...	...	Norseman ...	57	7	74	6
Cape Riche ...	154	9	...	...	Bulla Bulling ...	189	...	...	...
Pallinup ...	230	13	124	11	Woolgangie ...	...	...	238	3
Bremer Bay ...	356	15	331	16	Boorabbin ...	112	7	233	8
Jarramongup ...	179	11	105	10	Karalee	84	6	205	4
					Yellowdine ...	88	5	95	2
EASTERN DIVISION:					Southern Cross...	94	7	128	4
Lake Way ...	102	4	133	5	Mt. Jackson ...	72	4	37	2
Mt. Sir Samuel...	68	5	198	4	Bodallin ...	111	4	47	3
Lawlers	102	7	182	5	Burracoppin ...	...	...	...	...
Leinster G.M. ...	...	...	...	...	Kellerberrin ...	110	8	86	5
Lake Darlôt ...	82	2	...	...	Mangowine ...	198	11	...	...
Diorite King ...	...	...	...	...	Wattoning ...	...	...	...	...
Sturt Meadows...	...	...	...	...					
Mt. Leonora ...	94	6	185	6	EUCLA DIVISION:				
Mt. Malcolm ...	125	4	...	...	Ravensthorpe ...	209	6	143	12
Mt. Morgans ...	77	7	249	4	Coconarup ...	146	7	...	...
Burtville ...	...	...	...	...	Hopetoun ...	175	10	287	15
Laverton ...	146	6	208	4	Fanny's Cove ...	535	8	...	...
Murrin Murrin...	80	3	246	6	Park Farm ...	374	10	...	...
The Granites ..	67	4	136	4	Esperance ...	370	13	400	15
Tampa	95	3	199	3	Gibson's Soak ...	255	10	385	13
Kookynie ...	143	3	165	3	30-Mile Condenser	164	3	343	12
Niagara	171	...	161	4	Swan Lagoon ...	103	8	...	...
Yerilla	82	3	215	6	Grass Patch ...	88	9	...	...
Edjudina ...	...	...	196	6	Myrup	368	8	...	..
Menzies	136	4	96	5	Lynburn ...	197	7	...	...
Mulline	149	4	107	3	Boyatup... ...	...	...	...	...
Wangine ...	...	...	...	...	Middle Island ...	...	...	...	...
Waverley ...	251	5	65	3	Point Malcolm ...	70	8	...	...
Goongarrie ...	193	5	90	5	Israelite Bay ...	137	8	427	11
Mulwarrie ...	241	6	120	3	Bulbinia ...	208	7	...	...
Kurawa	219	7	31	3	Frazer Range ...	238	5	...	...
Dixie Gold Mine	...	...	...	...	Balladonia ...	125	8	76	8
Kurnalpi ...	88	3	43	4	Southern Hills...	280	5	...	...
Bulong	237	4	36	4	Eyre	162	13	349	17
Kanowna ...	283	6	47	5	Madura	...	...	...	...
Kalgoorlie ...	229	6	25	4	Mundrabillia ...	152	6	...	...
Coolgardie ...	220	6	135	4	Eucla	177	8	163	12

The Observatory, Perth,
9th July, 1902.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during June, 1902.

Name of Port.	No. of Consignments Inspected.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
						Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	85	10508	9099	1409	1409	4990	...	2666	...	...	207	...	762	175	278	...	...	...	21	...
Albany	5	177	171	6	6	65	...	18	...	...	15	...	68	...	...	...	...	...		...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hamelin	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...
Busselton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bunbury	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Total ...	90	10685	9270	1415	1415	5055	...	2684	...	...	222	...	830	175	278	...	...	...	26	...

Department of Agriculture,
8th July, 1902.

Return of Fruit Trees and Plants imported into Western Australia during June, 1902.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees. Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	38	58798	38	58798	...	...	...	4670	489	20063	1726	220	62	290	...	281	10098	9305	2501	2682	4681	...	1730
Albany ...	9	23238	9	23238	...	...	...	367	162	13273	1067	551	300	86	...	94	159	2117	1498	1575	540	...	1449
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hamelin ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Busselton ...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...
Bunbury ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...
Total ...	47	82036	47	82036	...	...	...	5037	651	33336	2793	771	362	376	...	375	10257	11422	3999	4257	5221	...	3179

Department of Agriculture,
8th July, 1902.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

Salt for Sheep.—The value of salt for sheep is shown by an experiment in France, where three lots of animals were fed on hay, straw, potatoes, and beans for 124 days. One lot had no salt, one had $\frac{1}{2}$oz. of salt each every day, and the other had $\frac{3}{4}$oz. Those that had $\frac{1}{2}$oz. gained $4\frac{1}{2}$lbs. more than those which had no salt, and $1\frac{1}{4}$lb. more than those which had more than $\frac{1}{2}$oz. The salted sheep clipped $1\frac{3}{4}$lb. more of wool and a better fleece than those that had no salt, showing better results in the wool.

Food Value of Honey.—Few people know that honey possesses a great value as a food on account of its ease of digestion, and is especially desirable for those with weakened digestive powers. The nectar of flowers is almost entirely cane sugar. The secretions added by the bees change this to grape sugar, and so prepare it that it is almost ready for assimilation without any effort on the part of the stomach. The unpleasant symptoms from which some suffer after eating honey may often be removed by drinking a little milk.

A lasting Whitewash.—Slake $\frac{1}{2}$ bushel fresh lime with boiling water, and cover to prevent evaporation. Strain so as to take out all lumps of the lime (a piece of window netting fastened over a small bottomless box answers nicely), add 1 packet salt that has been dissolved in warm water, 3lb. rice flour made into a smooth boiled paste, 8ozs. Spanish white, 1lb. glue dissolved, and 5gals. hot water. Mix well, put over the fire, and stir until it reaches the boiling point. The whitewash is now ready to apply, but if a little too thick to go on well, add a little hot water. If rice flour cannot be had, a thin paste made of wheat flour will do nearly as well. Apply while hot, and if it begins to cool before it is all used, reheat it.

Dry Bordeaux Mixture.—When fungus diseases appear on small plants in the garden or about the house it is often convenient to have the Bordeaux mixture in a dry form for prompt application. The following recipe is said to be satisfactory: "To make dry Bordeaux to dust plants, potatoes that have the brown leaf spot, or any fungus disease, dissolve the bluestone in water and then slake the lime with the blue water, putting only enough to make the unslaked lime crumble to a dry powder, which you can dust on with your hand when the vines are wet. To unite caustic—lye—and lime for aphis, melon lice and other soft insects, dissolve the lye and then slake the lime with it. Rose slugs and green aphis will be removed if you dust this on them."

Finding the Queen.—The *Bee-keepers' Review* gives the following directions for finding the queen by a Californian bee-keeper Mr. Henry E. Horn:—"Blow some smoke into the entrance to alarm the colony. Two or three puffs will be sufficient. Take off the cover and watch the behaviour of the bees. Those at a distance from the queen will come up between the frames and walk across the top bars. Keep close watch. Finally, at a given point, a dozen or two will stop and sort o' smell down between two certain frames. If these two frames are taken out together, the queen will be about the first thing seen when they are separated. This method never fails with me; but some little experience is necessary in order to catch on to the trick."

Drain the Gardens.—Draining is as important to successful cultivation as watering or manuring. It is a matter that is terribly neglected, and makes a very large proportion of our cultivated soil unproductive over many months in the year. Surface drainage is rarely sufficient. Water is the great agent for carrying and providing air and food to the plants. When water sinks in and dries out again through the surface, the cultivation has no control over the soil or crop. To get the very best results, water must move laterally, not up and down in the soil. It must never be stationary, either in the soil or on the top. Therefore it is absolutely necessary that drainage be resorted to. It acts against both heat and cold, drained land being warmer in winter and cooler in summer than undrained. To obtain the best possible results from your garden, efficient drainage must be added to intelligent cultivation.

Formalin for Potato Scab.—Formalin can be used to destroy the scab disease in seed potatoes. Not only this, so far as we know there is no remedy as effective, and as it is not poisonous, is by all odds the best remedy to use. As in treating oats with formalin, solutions of different strengths have been used at the various experiment stations in treating scabby potatoes that were to be used for seed. The strength that has given the best results of any we have noticed is that used at the Montana Station, where the seed was kept for two hours in a solution of formalin in the proportion of 8ozs., half a pint, to 50gals. In this case the seed was very scabby, and the resulting crop showed but 1 per cent. of scabby tubers. Besides these good results, formalin has the added advantage, mentioned above, of being non-poisonous and non-corrosive, and may be used either in wooden or metallic vessels. There is danger of injury to the seed in using corrosive sublimate by getting the solution too strong or leaving the seed too long in the solution. A strength that has been used successfully and without injury to seed is 2ozs. to $2\frac{1}{2}$ozs. of corrosive sublimate to 15gals. of water, and keeping the seed in the solution for an hour and a half, letting them dry, and then cutting them; but why use this strong corrosive poison when a later and better remedy has been found? If corrosive sublimate is used it should be mixed in wooden vessels, and

kept from animals as well as man to avoid accidental poisoning. In treating scab, it should be remembered that it occurs on other plants, and that it may remain in the soil for a considerable length of time. It is therefore important that rotation of crops should be practised in addition to the treatment with chemicals. To get the nicest, cleanest potatoes, it would be better to have at least five or six years between the crops on the same piece of land, and avoid the use of manure from cattle which are fed on turnips, rutabagas, and other plants on which scab occurs.—*Farmers' Voice.*

FEEDING RECENTLY-WEANED FOALS.—I have been told frequently by some of my neighbours that I must have a happy knack of weaning foals, as they never bear any indication of being deprived of the mother's milk when weaned. This may be so, but I am not disposed to accept of much credit for it, and there is no secret attached to it. I know there are various ways of weaning foals, and some of them, I fear, are very bad ones, and do not always show the care and forethought one would expect from practical men. Two years ago a friend of mine, a good farmer and a man with a general knowledge of stock, killed one of his foals in weaning it. He took it from the mother rather suddenly, gave it a considerable quantity of cow's milk and barley meal, and in a day and a half it was dead, and it is a most common circumstance to find foals shrink both in body and spirits extremely when taken off the mother. They are not prepared in any way for the sudden change, and those weaned early are ill-prepared to provide for themselves. They may be able to eat grass, but know nothing of corn or hay, and soft grass in the autumn, without some binding material, is poor food at best. Such foals may ultimately grow into substantial horses, but for the first year, at least, the check in weaning dwarfs very many of them, and is much against a ready sale at the best price if the foal is sold after weaning. My plan—and I have proved it to be a good one—is to begin a fortnight or so before the foal is to be weaned, and gave it a little crushed oats, bran, and chaff, daily. It is put in a loose box to feed, and is kept away from the mother for an hour or two. Only about one pint is given at first, and sometimes it will hardly look at the food when it is kept longer away from the mother and flavoured with a little hunger, but when once the flavour is understood, there is no difficulty in getting it to eat all put before it. My only foods are crushed oats and bran—old oats are the best, and both should be fresh and sweet. If they smell of rat or mice-droppings or any muck of that sort, little will be eaten, and the foal will not progress. A small quantity of chaffed hay is also added. Beginning with half-a-peck, this is increased slowly till, by the time the foal is taken from the mother, it will receive about one peck daily, and about half of this will be hay and half oats and bran. The foal is never taken in from the grass, excepting to receive its food, which is given twice daily—morning and evening. The oats and bran are continued all the winter, and the foal has always a growing appearance throughout, being both sleek and active.—*Farmer and Stockbreeder.*

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

By Robert Hall.

PART IV.

BIRDS INSECTIVOROUS AND FRUGIVOROUS.

[More or less Useful.]

There is no bird that keeps entirely to fruit as a diet, but as will be shown in a following part there are some which are very thorough pests from the point we view them. Although those under this head show a distinct partiality for fruit they are to a greater extent worthy of our support in the open and their expulsion from the orchard and vineyard.

Certainly a great slaughter would be an unwarrantable disturbance of the balance of nature. A severe punishment on the spot where the fruit grows would meet the case. It is very much a matter of opinion whether a certain bird is or is not an unpardonable nuisance, for, with so little evidence upon economic bird life as this State is yet able to supply, nothing practical can be done on a broad scale without unsafe results.

Certainly it is our duty in the course of self-preservation to treat the birds of this part in an ungracious way, when, upon intrusion they are found guilty of what in our law is called theft and damage on a large scale.

I am strongly disposed to notice in the first part the Silver-eye (*Zosterops gouldi, B'parte)*, but for want of fuller knowledge of the habits of the bird I refrain for the present. I am of opinion it should rank there just as its representative in the east does, because of the distinct advantage it is as an eater of aphis, casemoths, and scales. One hears of a hundred cases of grape-stealing, but seldom of one which occupies nine months of the year of coccid killing. A bird that specially eats millions of obnoxious insects in the surrounding timber is worth saving when beyond the orchard. Birds that we know as Honey-eaters are mostly fruit and insect-eating, and as a whole prove decidedly useful in the selection of their food. Until more is known of the economy of the different members of the family we are obliged to consider the Honey-eaters more as a whole than individually. For the present they rest within this section with a tendency to being birds more useful than

Leaden Crow-Shrike.

(*Grey Magpie: Squeaker.*)

Strepera plumbea, Gould. *Sub-sp. of S. cunei caudata*, Vieill.
(*Strep'e-ra plum'be-a.*)

Strepere, to make a noise; *plumbum*, lead.

Strepera plumbea. Preserved specimens, the Museum, Perth.

Geographical Distribution.—Area 9.

Key to the Species.—General appearance, deep leaden grey, very little paler below than above; wings black, secondaries margined with dull grey and tipped white, basal half of inner webs of primaries white; tail black, margined with grey and tipped white; under tail coverts white; nostrils bare and placed high in the maxilla; tail does not exceed 8·5 inches.

The Grey Magpie, although too good to be outlawed, is not without sin as the fruit-growers view its actions.

The general habit of this species is to fossick for food upon low-lying grounds, or in the vicinity of river courses, where it can find insects and their larvæ with the least amount of labour, as it prefers working upon the ground. All the members of the genus adopt this means to get a living, and they have become thoroughly expert in their ground movements. In form there is a strong resemblance to the Crow, but in habits there is a great difference. The Crow-Shrike is not a carrion eater. Its relationship to the shrike is more remote than, and is held together through the medium of, the magpie (*Gymnorhina*). The Strepera lives very largely on insect food, but it also causes considerable annoyance to the orchardist. The Grey Magpie is excellent eating, so, when killed, it should never be wasted. Dr. James Norton, writing in the *Agricultural Gazette*, of New South Wales, 1897, remarks:—"The Streperas are generally classed among insectivorous birds, being, therefore, presumably friends of the fruit-grower, and no doubt they do eat a great many insects when they can get nothing more to their taste. About Springwood, at all events, they are more destructive to fruits than all the other birds put together. They are wholesale devourers of apples, pears, peaches, plums, quinces, grapes, figs, and every other kind of fruit, including even unripe date plums, which one would have thought sufficiently astringent to disgust any bird. They are terribly destructive to maize, the sheaths of which, covering the young cobs, they strip back to enable them to pick off the sweet, milky grasses just as they are ripening. They may be driven off by shooting, but soon return if not continually watched. They are particularly destructive to grapes, which they appear to swallow whole, and, notwithstanding the protection by nets, they manage to get at the fruit by searching carefully for any small opening which may be accidentally left, and even sometimes cut their way through the net itself. If the bunches be bagged they will look for a small opening, and if present make it larger with their bills. I have known them to tear their way through the bag, if not of strong material, and then at leisure devour every berry. Large fruit is generally cut to pieces and devoured as it grows, but it is some-

times carried off, after the manner of the common Crow, to a neighbouring tree, probably impaled on the bird's beak if too large to carry in the ordinary way.

Continuing his notes, Dr. Norton remarks:—"It is only fair to say that, though the Strepera is so terribly destructive in my neighbourhood, yet in other places he does little or no mischief, probably confining himself to an insectivorous diet and adding the wild fruits, which he eats here when the garden fruit is gone, and among others that introduced nuisance, Phytolacca (ink plant)."

One of the present writer's observations was to see this species tearing open the bagging around the stems of the apple trees to get the codlin moth pupæ. In that particular orchard it did not touch the fruit.

Nest.—Open and made of twigs, lined with finer twigs; placed in trees between forks: bulky.

Eggs.—Three or four to a sitting; pale wood brown or ruddy-brown, marked liberally with darker brown. Length 1·7 inches; breadth, 1·2 inches.

Green-Backed Silver-Eye.

(Blight-bird, Ring-Eye.)

Zosterops Gouldi, B'parte. *(Zos-te' rops, gould'i.)*

Zoster, a girdle; *ops*, an eye; *Gould*, a proper name.

Zosterops chloronotus, Gould, "Birds of Australia," fol., vol. iv., pl. 82;

"Key to Birds of Australia," Hall, p. 38 (1899).

Geographical Distribution.—Area, 9.

Key to the Species.—Ring of white feathers round eye, upper surface olive green with head and rump the same colour, though sometimes brighter; throat olive yellow; breast ashy grey; sides of body clear rufous or pale chestnut. Total length, 4·25 inches.

This and the eastern species are good representatives of each other in their actions, habits, and economy. But for a slight differentiation in plumage they would rank as one.

Altogether there are eighty-eight known specimens of silver eyes, six of which are found in Australia; four of them in our State. It is particularly fond of living and nesting in pairs among the tea-tree *(Leptospermum)*, but it goes beyond it as often as not. The family flocks are generally eight in number, and as they travel through the orchards a slight warfare is made upon them, for in spring and summer they feast upon small fruit, in autumn upon late apples. Certainly its taste for commercial fruits is cultivated when opportunity stares it in the face, but what about the good which I am sure it does? I remember seeing a silver-eye hunting along the branch of a tall pear tree. An insect fell from its hiding place, and simultaneously the bird swooped perpendicularly in time to catch the lesser form, and with a right-angled movement escaped the ground, to which it was unpleasantly close.

It is the scourge of the aphis and other noxious insects, when there is no fruit upon the tree, giving special attention in the wild timber to the Acaciæ. I will quote a case beyond my own knowledge of its special service. Mr. W. H. F. Hill writes:—"Amongst the birds, the silver-eye is the chief enemy of the casemoth, destroying the young larvæ in great numbers. Indeed, but for these useful little birds the casemoths might easily become a serious insect pest, as they threaten to be in the various city parks and enclosures where the silver-eye does not dare to go."

In New Zealand the "Transactions N.Z. Institute" renders a very praiseworthy account of the good done by this bird as an aphis destroyer.

Green-Backed Silver-Eye.

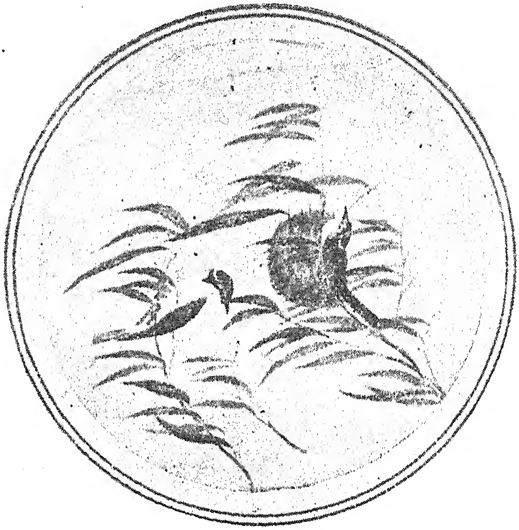
Silver-eyes dread the tyrant Butcher-bird, and I have found that one or two kept in the gardens with cut wings serve the purpose of good police when the grapes are ripening. Their voices are a terror to the Silver-eyes. The Butcher-bird (Whistling Jack; Derwent Jack) is found in our State.

The eggs are laid on alternate days, and at an early age the young assume the general plumage of the adult, and then go through the details of the seasonal changes. The nest near grazing areas is formed of fibres, lined with the hair of the horse, cow, or other animal, and externally covered with mosses. On the Houtmans Abrolhos, in 1899, I found a nest peculiarly built within "pig face" (*mesembryanthemum*), and less than a foot from the ground. There

were no trees, and, but for a few shrubs and this weed, all is dead coral and brackish water. The nest was beautifully made of marine weed.

Nest.—Cup-shaped and deep, suspended; made of grasses and surrounded more or less with green mosses, or as described above. It is seldom more than six feet from the ground. The accompanying figure shows a typical cup-shaped nest.

Eggs.—Three or four to the clutch; uniform pale blue. Length, 0·6 inch; breadth, 0·5 inch.



WESTERN LUNULATED HONEY-EATER.
(*Black-headed Honey-eater.*)

Melithreptus chloropsis, Gld. (*Mel-i-threp'tus*; *klo-rop'sis.*)

Mel, honey; *threpsis*, nourishment; *chloros*, pale green; *ops*, the face.

Malithreptus chloropsis, Gould, "Birds of Australia," fol., vol. iv., pl. 73; "Key to the Birds of Australia," Hall, p. 38 (1899).

GEOGRAPHICAL DISTRIBUTION.—Area 9.

KEY TO THE SPECIES.—Crown of head, black; white band across occiput; chin pure white; under surface white; naked space above eye white to greenish white; bill shorter than rest of head; operculum partly covered with feathers, first primary about third length of very long second primary; tip of wing formed by third, fourth, and fifth quills; secondaries very short, two-thirds length of wing; tail slightly emarginate.

Whether the present form is a genuine species or a sub-species yet remains to be proved. The British Museum, as an authority, places it with *M. lunulatus*, and considers the Western and Eastern birds as one and the same. An examination of the soft parts, as the eyelids, at once shows them to be different, and the case is one where "doctors differ."

It is an example of a species that appears to carry at least three phases of coloration in the region of the eye.

If this idea of the writer is accepted, the species will form one; this bird will be a variety of *M. lunulata*.

At the moment this is the position, and there it will remain till such time as some ardent field observer will develop the research.

It is a remarkably active bird, both in its life amongst the high "gum" foliage and its flight. Certainly it is an acrobat, falling from one bough to another without any apparent change of form in doing so. If while in the pendant position it be easier to make a somersault in order to arrive safely a few inches below, it does so, and proceeds to the business of providing provender or engaging in battle without loss of time. This little bird carries a "moon" on its neck, as one in the first quarter. Native and introduced fruits strongly tempt both young and old, but it is a considerable time before they care to investigate trees bearing fruits they have not been accustomed to eat. Eucalypt blossoms, laden with nectar pots well filled, are a partial supply for all honey-eaters. Insects form the greater part of the diet in winter and a large portion in summer. Orchards in heavily timbered country suffer most from this species, but even so, to no very great extent.

Nest.—Neatly made and cup-shaped; made of grasses, with a few spider cocoons or native grass pappus for exterior ornamentation. Generally it occurs in a high position in a jarrah or karri tree.

Eggs.—Two or three to the clutch; ground colour tawny with reddish spots. These may form a zone round the larger end. Length, 0·75 inch; breadth, 0·5 inch.

Red-wattle Bird.

(*Wattle Bird.*)

Acanthochæra carunculata, Lath. (*A-kan-tho-ke'ra ka-rung-ku-la'ta.*)

Akantha, a spine (a thorn); *chaera*, representing a genus of perching birds (Passeres); *caruncula*, a fleshy excrescence.

Anthochæra carunculata, Gould, "Birds of Australia," fol., vol. iv., pl. 55, "Key to Birds of Australia," Hall. p. 44, 1899.

Geographical Distribution.—Areas 9, 7, 6, 4, 3.

Key to the Species.—A long greyish bird, with longitudinal white marks upon the plumage; wattles ½-inch long and blood-red to reddish yellow; tail graduated, as long as wing (about 6 inches); bill same length as head; nostrils longitudinal and operculated.

We have two species called Wattle-birds, but as one has no wattle, it behoves us to use care in identifying it.

This bird has genuine cheek wattles, and although the Little Wattle-bird has none it is similar in many other respects, yet without white streaks to the feathers of the mantle.

The present species has a wide vocabulary, from an unpleasant guttural noise to one pleasant to a limited degree.

When the young begin to call, there is little to choose between that of the practised syrinx and the one undergoing the tediousness of a lesson. The length of the youthful bird as it leaves the nest is nine inches, while that of the parent is fifteen, and the difference will give anyone critically inclined in the study of music an opportunity to further investigate. As the tail grows there are variations in the general plumage, being light-brown in the young, where the adult shows a tendency to white.

After the breeding season in the east there is a general marshalling of forces. Thousands of young and old meet and hover for days, collecting for a general exodus northward.

RED-WATTLE BIRD.

Even a million birds have been estimated in the great flock finally moving northward. This is to provide for warmer weather just as occurs with most species. Like man, they provide a warmer clothing, but unlike him with reference to ourselves they have the liberty of moving for climatic change.

Such a rotation of change of residence not only provides the birds with a suitable temperature, but invigorates them for the household and family duties of the nesting season in the following spring. Many birds have a hard time in getting their daily bread, and they must move on. How and when the migration from the

south to the north of our State is conducted is unknown to us. Our opportunities to know are before us.

Nest.—Open, loosely constructed of twigs, and lined internally with hair, fur, etc.; placed near the ground, and in a fork generally.

Eggs.—Three to a sitting; ground colour salmon buff, with chestnut markings upon it; slatey-grey markings below the surface. Length, 1·25in.; breadth, 0·8in.

THE PIG AND HIS FOOD.

SUGGESTIONS FROM SEVERAL COMPETENT AUTHORITIES.

Suckling pigs take nourishment from the dam about every two hours, and we may accept Nature's guidance for the frequency of feeding very young animals (says W. A. Henry, in *Rural World*). At weaning time the pigs should receive feed at least three times daily, with water always accessible.

Since the digestive tract of this animal is of limited volume, probably the best results in fattening can be obtained with three feeds daily; but habit controls here as elsewhere, and stockmen can easily accustom their animals to expect feed morning and evening only, meanwhile being content.

Since meal, when dry, is more slowly masticated than when moistened, it might be supposed that the greater addition of saliva consequent upon slow eating would increase the digestibility of meal so fed, but the trials so made favour moistening the feed with water.

Observations show that the pig does not take kindly to dry meal, eating it very slowly, and very often rooting much of it out of his trough. On the whole, sloppy feeds are best for the pigs.

The pig utilises the greatest percentage of the food consumed of any of our farm stock (says an exchange). It costs less to produce a pound of pork than to produce a pound of beef. The pig utilises 20 per cent. of the food consumed, while the ox utilises but 8 per cent. The pig is one of our best sources of ready revenue on the farm.

A large digestive capacity is of prime importance in meat-producing animals, and in this particular the hog stands pre-eminent among our farm stock.

Early maturity being of great importance in our pigs, we might be inclined to select a short, thick sow, tending to fatten early, with the hope of getting this quality in the pigs, but such a sow will not be a good milker or give large litters; hence these characteristics must be reached through the sire.

The good breeding sow should be rather long and roomy, with well-sprung ribs, broad loin, deep sides, and some length of neck. Let the sire be shorter, more compact, and with finer bone, which type indicate early maturity.

In answer to a question, J. H. Rour, in *American Agriculturist*, says: "While I have had no experience in killing pigs with potato water, I have found by actual use that a more profitable as well as palatable article of food can be made from boiled potatoes for swine or any other animal by immediately draining off the water after boiling, and mashing them up while hot. Pigs like them better. They will keep longer without souring, and will give better returns. As to feeding them the water they are boiled in, I would prefer using it to kill lice on cattle, having heard it highly recommended for that purpose. Those who feed boiled potatoes to swine, try my way and see if they are not relished."

For finishing hogs for the butcher, shorts, peas, corn, oats, and barley are the best. And here is variety, too.

If you keep large hogs without gain and pigs on a maintenance ration only, look out for loss in both ways.

Black teeth in pigs do not indicate disease. Just what causes them has never been satisfactorily explained.

An outbreak of anthrax has occurred in Waikato district, New Zealand. Several cattle have died and men who handled the animals caught the disease, and are now in the hospital. One is not expected to live, but two others are less seriously affected.

The candidates at the examination held on the 26th of June who have been successful in obtaining bursaries at the Queensland Agricultural College are Mr. J. W. Nuttall, of the state school, Harrisville; Mr. S. I. Millars, of Woodend Road, Ipswich; Mr. L. N. Walker, of Hume Street, Toowoomba; and Mr. A. R. Smart, of Alexandra, Mackay. The candidates passed in the order given.

BOVINE TUBERCULOSIS.

A Disease not confined to the Lungs of Cattle.

Professor A. R. Ward, at Hanford Farmers' Institute: Professor Ward said that he did not mean to enter into a discussion relative to the menace to public health that is claimed to originate through tuberculosis, but to speak more particularly of the disease in cattle. He claimed that tuberculosis in cattle is about the same thing as consumption in people, but the general idea that the disease is one of the lungs is a mistake, as it may occur anywhere in the muscle portion of the body, and especially in the lymphatic glands. He showed the germ of the disease to be minute, wormlike particles

which tend to poison that portion of the body in which they are located, and cause lumps called tubercles, which vary in size from a millet seed to lumps as large as two fists. One peculiarity about these tubercles is that they are composed largely of lime, and when cut open have a gritty sensation. This abnormal growth, in itself, will not spread or produce the disease, but is merely a manifestation on the part of nature against these poisonous germs.

The disease is not contagious only through milk, as oftentimes, when the lungs are affected, cattle standing in stalls cough up some of these germs, which are afterward gathered up by another animal, as in the act of eating. In this country the spread of the disease comes through the milk more than any other way, very few cattle being housed as they are in the East, where tuberculosis is much more prevalent than in this part of the country. He stated that the disease was not hereditary in nature, as calves had been taken from cows afflicted with tuberculosis and raised free from any signs of the disease.

He then dwelt on an explanation of the tubercular test that is being applied throughout the country at the present time. In the State University they are able to grow tubercles as they grow on cattle, producing both the germs and the poison that come from the disease. This is produced in liquid form, the liquid being boiled after the production of the poison in order to kill the germ and make the liquid safe to handle.

An animal suspected of having the disease is then treated with the poisonous liquid by an injection of about a teaspoonful under the skin. If there is any sign of tuberculosis about the animal it will be detected by a rise of temperature of from 4 to 6 degs. in a few hours. The only trouble with this test not meeting with universal success is the lack of confidence put in it by the cattle raiser, and a fight against the conditions that must be prevalent before a successful test can be made. Tests must be made when the animals are not in the least excited, as any excitement will have a tendency to raise the temperature and destroy the result of the test. Government officials often find this the case when they are making a test of a band of cattle, the owner, wishing to prevent the same, doing something to destroy the natural conditions of the stock. Dr. Ward said there was no cure for tuberculosis, unless it was a change of climate. He advised the scalding of milk of all cattle suspected of having the disease.

Upon being asked to speak of the disease relative to the human race, Dr. Ward said that there was no doubt in his mind but what it could be transmitted to people. It is an established fact that the disease of man, similar to tuberculosis, can be transmitted to cattle, but as far as known the test has never been made of the transmission of tuberculosis to man. The germs of consumption and tuberculosis are slightly different in appearance, but whether this difference comes through the difference of existing condition and habits of man and beast is hard to determine. The subject was an extremely interesting one, and was followed by a lengthy discussion.—*Weekly Chronicle.*

HOW TO PREPARE AND USE A STARTER.

By a starter, in dairy parlance, is meant a sour liquid containing a considerable amount of lactic acid, and lactic acid producing bacteria, which is used in milk and cream for the purpose of aiding and hastening the ripening or development of acidity. Whatever form the starter may take, whether sour new milk, skim milk, or whey, all these liquids are acid from the same cause—namely, that they contain chiefly lactic acid (though a small quantity of other acids) which has been produced from the lactose or milk sugar they contain being converted into lactic acid by the agency of bacteria, the chief types of which (as found in these starters) are lactic acid producing organisms only.

Now, we have two distinct classes of starters—(1) pure culture starters, and (2) natural starters. Pure culture signifies that the starter has been originally made from a pure culture of one particular kind of lactic acid producing organism specially isolated for the purpose. Such starters as these are usually prepared either by isolated lactic organisms from a clean, pure, healthy sample of milk; and preparing a starter in milk from this culture, or more commonly, and the commercial method, is to purchase for four or five shillings a bottle of commercial pure culture, specially prepared and put on the market by many Danish and Swedish firms. This bottle is opened and its contents (generally in the form of a white granular powder which contains the lactic acid bacilli) emptied into pasteurised milk, which in time becomes sour and constitutes the starter. The commercial pure culture is now frequently sent out in a liquid form, and may be used in the same manner in preparing the starter. Assuming that a bottle of culture be purchased, the manner of its preparation for use is as follows:—Take preferably a couple of gallons of freshly-separated milk and pasteurise it by scalding it to a temperature of 170 degs. Fahr., at which temperature it should be kept for at least one hour. This kills all the germs present in the milk and leaves it a blank food medium for the introduction of the pure culture or one special type of organism. Cool the milk to 80 degs. Fahr., and add the contents of the bottle, which should be thoroughly stirred in. Now, 80 degs. Fahr. is a suitable temperature for bacterial growth, and in about 20 to 24 hours the milk will have become thick and acid. Precautions should be taken that contamination in any form whatever is avoided, such as not using an absolutely clean and sterile pail and ladle for stirring, and, above all, a clean, airy spot must be found for setting the pail to stand in, and a piece of butter muslin thrown over the pail to prevent contamination by dust. A jacketed pail is most suitable for the preparation and renewing of a starter, as by the use of hot or cold water in the jacket the temperature can be regulated to a nicety, and this is a very important point, as too high a temperature—above 90 degs. Fahr.—with too quick acidification and separation of curd and whey, is nearly, if not quite, as

injurious to flavour of starter as too low a temperature, very slow acidification and bitter flavour becoming developed.

Consistency of starter is a point requiring attention. For introduction into milk, for cheese-making purposes, it should be only thickened to such a stage that it will blend itself well, and so become thoroughly incorporated with the rest of the milk. The consistency depends upon two points—temperature and percentage of lactic acid it contains. If kept at a comparatively low temperature, it may be strongly acid and yet not very thick and clotted, but if warmed up would immediately become thick and curdy. Generally speaking, a starter with ·8 or ·9 per cent. acid is satisfactory, though at this acidity it would be very curdy at a temperature of 95degs. Fahr., though of a capital and most desired consistency at 60 degs. to 65 degs. Once having prepared the starter, all that remains is to use and renew it. As the acidity would become too great and the starter stale and contaminated, about a quart is taken and put into a couple of gallons of newly-pasteurised, separated milk, cooled to 80 degs. Fahr., this operation being performed daily, and that not used discarded. Here again one has an opportunity of regulating consistency by the amount of starter introduced into the fresh lot of milk. If a very strong and vigorous ferment, probably one pint will be sufficient in renewing into two gallons of separated milk, and so on; the less used the thinner the starter next day, other things, that is, temperature, etc., being equal.

When used in cream which has been scalded or pasteurised, the cream should be at a temperature of 70degs., Fahr., and about five per cent. of starter added. With this quantity ripening is complete in 20 hours, when the cream will contain ·5 or ·6 per cent. lactic acid. The cream should at once be cooled, when ripe, down to the temperature at which it is to be churned, and kept there for two or three hours, as this improves the body or texture of the butter. Cream ripened at a high temperature has always a tendency to give oily taste to butter, but by the precaution of cooling the cream after ripe for several hours before churning this is entirely avoided. The main reason for pasteurising cream for butter-making is to avoid taint. Now, there are many who will not be at the trouble of pasteurising, but who might well use starters with advantage in raw or untreated cream, and this for two reasons:—(1) It will assist in elimination of any taint, though not to anything like the extent as where pasteurising is gone in for; (2) cream ripening is more easily controlled both as regards time and acidity. The only point that needs mention here is that the starter should be added immediately the cream is separated, at any temperature not exceeding 70 degs. Fahr.

The variety of cheese to be made, and the acidity in the milk to begin with, greatly influences the quantity of starter to be added. In spring time, when acidity is slow and difficult of development, three per cent. of starter, or thereabouts, is advisable for hard cheese-making; but later on, when milk is more acid to begin with

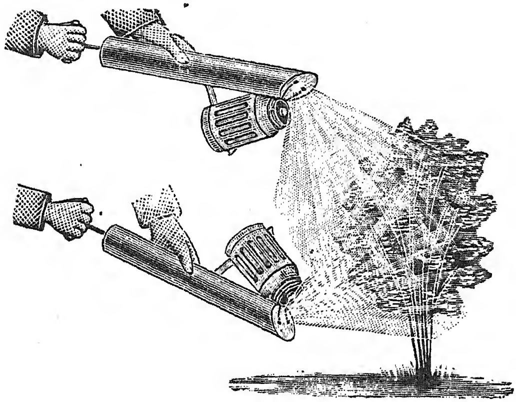
and gathers acidity much quicker, only one per cent., or often less, is required.

Natural starters, such as sour milk, whey, and buttermilk, if of good clean favour, and properly investigated as to their nature and origin, very often prove to be simply cultures of lactic acid organisms. For instance, it is well-known that the strongest growing micro-organism in a liquid can crowd out the weaker, as has been shown in experiments where milk highly charged with lactic bacteria has been inoculated with disease germs as cholera, and, on examination, in the course of a few hours the cholera germs have been found to have entirely disappeared—due to this crowding-out principle. Thus, assuming a comparatively pure dairy liquid as whey, entrance of air organisms and others of a contaminating nature from the surroundings, unless in specially large quantities, would find little chance for vigorous growth. It may thus be seen that natural starters may be, and often are, more or less pure cultures; but oftener than not they are simply a means of conveying taints from one day to another. Taints, no matter how careful the cheesemaker is, will sometimes make their appearance now, as they are for the most part caused by pernicious bacteria. Keeping the whey from one day and adding it to the next day's milk is simply prolonging the agony, or rather carrying a taint to, in all probability, what would have been a pure article. Again, buttermilk may act in exactly the same manner when used as a starter in cream. Now, it is frequently argued that natural starters give best flavoured produce, and I am undoubtedly of this opinion myself, when the natural starter is carefully selected, but if taken daily in a mechanical fashion, as is so largely done, without respect to its qualities, it is fifty times worse than none at all. Finally, pure cultures are sure, though, perhaps, lacking in flavour at first, and, on the whole, we feel inclined to vote in their favour.—C. W. Walker Tisdale, in *Agricultural Gazette*.

A NEW SPRAYER.

One of the most useful of the smaller sprayers that has come under our notice is the "Double Tube Sprayer" for small gardens, or for handling isolated trees a better article could hardly be had. The maker describes it as follows:—"The sprayer has detachable glass reservoir provided with our patent spring leather plunger expander. This is the only sprayer having a glass reservoir, detachable, encased so that the operator at all times can see the ingredients mixing, and just how they are working. The glass reservoir is made of the pattern of a Mason fruit jar, and any such will fit this sprayer; being oblong gives a churning motion while

the sprayer is being used, mixing the ingredients and will not allow Paris green to settle. The glass sprayer will not corrode or rust out. This will be appreciated at a glance. The Double Tube Sprayer covers a radius of two and a-half feet, producing two large sprays with one operation." The block has been kindly lent by Messrs. Wilson, Gray, & Co., of Perth, from whom the sprayers can be obtained for five shillings each.



The Double Tube Sprayer.

FOWL TICK

(Argas Americanus).

(By A. A. Brown, M.B., B.S., Department of Agriculture, Victoria.)

Introduction.

The ravages committed upon the herds of Queensland by the cattle tick *(Ixodes bovis)* have for some time arrested the attention of both scientists and pastoralists. The bush tick *(Ixodes plumbeus)*, in Eastern Gippsland, proves fatal to calves, lambs, fowls, dogs, and other small creatures. Yet another pest, the *Argas Americanus*, which claims Texas as its seat of origin, and which is very destructive to poultry, has begun to create alarm. The poultry yards of Mildura have been invaded by the *Argas Americanus*, or fowl tick. The fowl tick is allied to the mites and spiders, and is not very distantly related to the Queensland cattle tick. The fowl tick has found its way to Mildura either from South Australia or from New South Wales. In South Australia it has been particularly destructive, and reports from

New South Wales concerning its depredations are equally as unfavourable. Another variety of the Argasides (*Argas reflexus*) attacks pigeons, and yet another (the *Argas Persicus*) is said to be common in the fowl-houses of Persia, and to attack human beings. The *Argas moubata* in Angola, and the *Argas talaje* in Guatemala, are said to be very destructive to birds.

Anatomical Characters.

After the ingestion of blood the colour of the body is reddish brown. The length varies. Usually it is a quarter of an inch, but may even be three-eighths of an inch in length. The female is considerably larger than the male. The breadth averages about one-sixth of an inch. The body, which is very thin, is flattened superiorly and inferiorly, and is oval in shape. The dorsal portion of the body anteriorly projects over the head and mouth, so that these parts lie behind the margin of the body boundary, and posteriorly the body projects beyond the anal and reproductive openings. The whole appearance presents a tortoise shape. The whole margin of the dorsal surface is turned upwards, and is serrated. The upper surface is covered with numerous round pits, which vary in size. They are larger in the middle of the back, and become smaller as the edge of the body is approached. Two large pits occupy the middle of the anterior third of the body, and lie just in front of the middle transverse curved row of six pits smaller in size. Behind these again are six other prominent pits. On the posterior third of the body are radiatory rows of these pits. The margin of the ventral surface of the body is pitted as on dorsal surface. The palpi are long and slender, and even when stretched out do not reach anterior edge of body. A chitinous framework supports the legs and mandibles. The cuticle of the whole body is tough and resistant, and penetrated by the stigmata or breathing pores. The stigmata are the external openings of the tracheæ or air-tubes—the organs of respiration—which ramify through the body. There are four pairs of hairy legs, each consisting of five segments, and the distal segments possess long curved claws.

Life History.

The female, which is larger than the male, lays a great number of eggs. The eggs are laid in clusters of from 30 to 100 or more. In some cases even the young are born hatched. The eggs are laid in crevices of wood work, or under the bark of trees, or in any sheltered situation. The young are soon hatched. They are about one-twenty-fifth or one-thirtieth of an inch long. They possess four distinct pairs of legs. The anterior pair are short, and extend parallel to the mandibles. The anterior pair of legs and mandibles project in front of anterior end of body.

The adult parasites frequently moult, and seem, even when deprived of food, to regain new vigour after moulting. They can be kept nine months, and even longer, without food.

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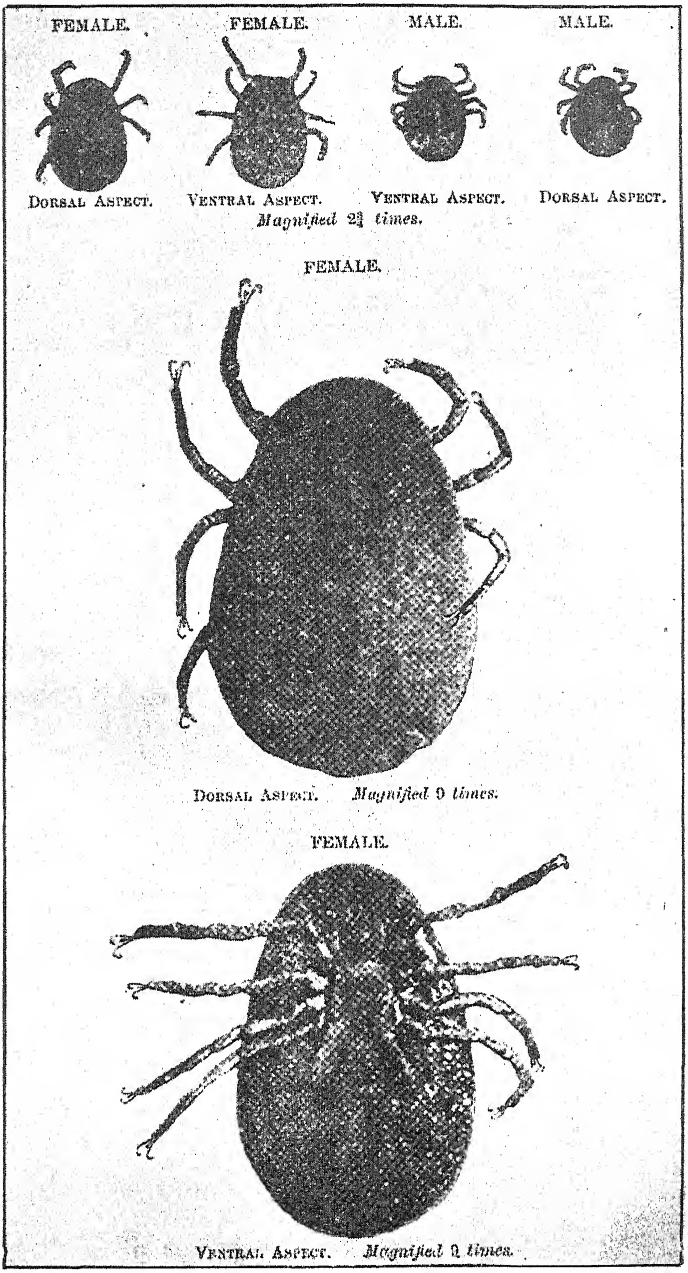
DIAGRAMS OF FOWL TICK (ARGAS AMERICANUS).

(Photographs kindly taken by Mr. A. Carmichael, Income Tax Commissioner's Office.)



Habits.

They are nocturnal in habit. They hide by day in the crevices of the fowl-houses, or under the bark of trees, or other secluded places, and may even perhaps hide under the wings of fowls, and they issue forth at night to commit their depredations. They prey on the blood of fowls, and cause anæmia and death. When they have sucked themselves full of blood they fall off the fowls and retire into the crevices, and come out again when hungry. When they bite their victims they may also inject a poison into their blood streams. The *Ixodes plumbeus* injects a poison into its victims. Its bite sets up considerable irritation around the spot. The Argasides creep in masses upon their victims and get under their wings and legs.

Symptoms produced by the Tick.

The symptoms are indefinite. The fowls droop, refuse to eat and drink, and in a few days they are unable to move about, and die of exhaustion. As the ticks are not, except in rare cases, seen about by day the cause of the mortality may for a long time escape notice, but examination of the fowl-houses at night will eventually lead to the discovery of the cause.

Natural Habitat.

These parasites are exotic. Their natural habitat points to Texas—the home of the cattle tick. They have reached Australia through importations of fresh stock from across the seas.

Remedial Measures.

The Argasides are very tenacious of life, and the only way they can be destroyed, when found upon the bodies of fowls, is by resorting to remedies that, whilst suffocating them, will not injure the birds. To kill these pests it is necessary to block up their stigmata or breathing pores, by which air is admitted to the air tubes. When their breathing is arrested they die practically of suffocation. I have found, by actual experiment, that kerosene alone is not an effective remedy, but that kerosene and soap emulsion is. Oil alone is not to be relied upon, but a mixture of oil (two parts), caustic potash, 10 per cent. solution (four parts), and kerosene (six parts) is a deadly compound to tick, and makes a most effective dip. Mixtures of kerosene and oil bring about death, so also do mixtures of oil and caustic potash. Strong solutions of ammonia in time kill them, but alcohol entirely fails to injure them. Strong solutions of either arsenious acid or perchloride of mercury are absolutely worthless remedies.

When fowl tick appears on a place there is no other course open, if the owner wishes to rid himself of the pest, but to pull down wooden fowl-houses and erect corrugated iron ones capable of being readily dismantled. The houses should from time to time be dismantled and washed with solutions of lime and sulphur. All

places that harbour tick should, where practicable, be burnt, but where this is impracticable all crevices should be cemented up and coated with tar. Tick hide sometimes under the bark of trees, and such trees should be uprooted and burnt. No half-measures are of any use in attempting to exterminate this pest, but the most drastic measures must be adopted to secure successful eradication. All crates arriving from places where fowl tick abound should be destroyed, as by means of such crates the disease may get introduced into localities previously free from it.

STOCK DEPARTMENT.

Report of the Chief Inspector for the Year ending 30th June, 1902.

The Hon. the Minister for Lands.

Stock Department, Perth,
4th July, 1902.

Sir,—I have the honour to forward, herewith, my Report on the working of the Department during the twelve months ending the 30th of June, 1902.

The Stock Imported.

There has been a decrease in the importations from the Eastern States during the year of stock for slaughter, but our outside requirements to supply the trade are still very heavy. The following return shows the number of stock landed at the various ports of the State, and overlanded at Wyndham and Eucla:—

Inspection Station.	Horses.	Fat Cattle.	Sheep.	Dairy Cows.	Stud Rams.	Stud Ewes.	Stud Bulls.	Pigs.	Dogs.	Fees Collected. £	s.	d.
Fremantle	1,209	6,808	70,579	555	2,724	16	203	1,010	122	869	16	7
Albany ...	107	45	950	25	46	38	2	...	17	32	10	8
Esperance*	5	...	...	...	...	...	9	...	...	0	16	0
Eucla* ...	55	...	489	...	2	...	...	2	2	8	10	1
Geraldton	...	...	...	...	95	...	...	...	...	0	10	0
Wyndham†	124	5,737	...	...	...	...	...	...	...	50	12	6
	1,500	12,590	72,018	580	2,867	54	214	1,012	141	962	15	10

* Returns for June not included.
† Returns from 18th May to 30th June, 1902, not included.

In addition to the above statement of imports, the following stock were also landed:—Fremantle, 103 donkeys, 20 deer, and 3 goats; Albany, 1 goat; Eucla, 3 camels and 3 goats.

In the past it has been the custom for the Department to compile returns for each calendar year, and for comparative purposes I will give the imports of stock for slaughter during the years 1897-1901, together with the returns for the period under review, which are as follow:—

Year.	Cattle.	Sheep.	Pigs.
1897	13,225	118,544	8,587
1898	15,410	79,802	8,615
1899	7,921	88,338	4,322
1900	13,105	81,423	4,359
1901	13,511	64,130	1,425
1901–1902	12,590	72,018	1,012

The stock shipped South from the Kimberley Districts during the twelve months were as follow:—

District.	Horses.	Cattle.	Sheep.	Pigs.
East Kimberley ...	12	10,172	...	18
West Kimberley ...	...	6,648	16,931	...
Totals	12	16,820	16,931	18

N.B.—In reading the East Kimberley shipments, it must not be overlooked that 5,737 head of cattle were overlanded from the Northern Territory.

Exports of Stock.

In the past, Western Australia has practically not embarked in an export trade; but during the twelve months under review, steps have been taken to feel the South African market, with the result that our East Kimberley Inspector, in a report dated the 17th of May, 1902, stated:—"I have just inspected 772 heifers from Auvergne and 1,328 heifers from Argyle Downs, making a total of 2,100 for shipment to South Africa. They are a very nice healthy lot."

Finance.

During the year the total expenditure of the Department was £2,884 15s. 9d., and the receipts amounted to £1,788 7s. 4d., the actual cost of working the Department for the twelve months thus being £1,096 8s. 5d. The following tabulated statement shows the

cost of the Department in comparison with previous calendar years:—

Year.	Receipts.	Expenditure.	Actual cost to State.
	£ s. d.	£ s. d.	£ s. d.
1898	667 12 1	4,776 14 10	4,109 2 9
1899	1,013 1 2	2,688 10 8	1,675 9 6
1900	1,398 17 6	2,865 8 5	1,466 10 11
1901-1902 ...	1,788 7 4	2,884 15 9	1,096 8 5

The amounts collected at the various inspection stations were as follow:—

	£	s.	d.
Fremantle	1,585	11	10
Perth	85	1	0
Albany	41	10	1
Esperance *	0	16	0
Eucla *	20	8	5
Geraldton	4	7	6
Wyndham †	50	12	6
Total	£1,788	7	4

* Returns for June not included. † Returns from 18th May to 30th June not included.

I might state that when this branch department was started in 1896, the annual cost of carrying on the work of stock inspection was in excess of £6,000, since when the receipts have greatly increased, and the expenditure has shown an appreciable reduction. To bring about these results the strictest economy has always been practised in working the Department, and, considering the enormous area of the State, I do not think a more economical system of inspection could be followed than that being adopted, without endangering the present comparatively clean condition of our flocks and herds.

Work of Inspectors.

During the year the bulk of the inspection work has been carried on at the coast, the ports of landing for imported stock being well officered to prevent the introduction of diseases foreign to the State. These inspectors examined 91,169 imported animals, and the absence of infectious or contagious diseases among the stock in the State evidences the effectiveness of their work.

The spread and increase of tick and lice among the flocks necessitated the appointment of three additional inspectors during the latter half of the year, and the work of dipping all infected sheep is being proceeded with. Up to the present time some difficulty has been experienced in the Southern Districts, where two inspectors are engaged, owing to the water famine, the weak condition of the sheep, and the near approach of lambing in some instances. All infected sheep will, however, be dipped as speedily as possible.

Diseases in Stock.

In comparison with the condition of stock in the Eastern States, the flocks and herds of Western Australia remain singularly healthy, and I attribute this largely to the rigorous inspection all classes of imported stock are submitted to on arrival at our ports of landing.

The tuberculin test was applied by the Veterinary Surgeon (Mr. R. E. Weir, M.R.C.V.S.) in several suspicious cases, and, with one exception, none re-acted. This particular animal, a stud short-horn bull, the property of Messrs. McPherson Bros., of Carnamah, was found to be badly tuberculous after slaughter.

Influenza, in an epizootic form, has again been the cause of much mortality throughout the State; especially has this been the case among young pigs, some piggeries losing from 40 to 50 head. Owners, however, have been much at fault for not reporting the out-breaks earlier, as the disease could have been successfully checked at the outset.

Impaction, especially among dairy cows, has also been a source of trouble to stock-owners, and until a system of irrigation is adopted for the production of green fodder for summer use, we may expect repetitions of this malady.

Stock in the South and Eastern portions of the State have suffered considerably from the long dry summer, and a number of the weaker animals have perished.

Fats, however, from the North are arriving in particularly good condition, and the same may be said of those from the tick-infested areas. Some of the shipments have been remarkably free from tick this season, whilst others again have been badly infested. Symptoms of tick fever have not been so noticeable as in past years, but a few of the shipments clearly showed that the animals had suffered some short time previous to arrival.

Very little disease existed among stock shipped from the Eastern States, excepting as the result of colds contracted on the voyage.

Several sudden deaths were reported among dogs at Wyndham and Hall's Creek, which were attributed to epizootic influenza.

I am pleased to report that there have been no outbreaks of pleuro-pneumonia in the epizootic form during the period under review, and it is evident that the outbreak which occurred at Gingin in 1899 was successfully stamped out. I am in hopes that the close inspection to which all cattle are submitted on their arrival at our ports will prevent more cases of the disease being introduced among the herds of the State. With the same object in view, overlanding cattle are also closely inspected.

The latest reports from East Kimberley are of a more satisfactory nature, as they tend to show that the cattle on stations

which have been infested for a considerable period are now apparently immune to the disease, and the mortality is much lighter than when the tick first made their appearance in large numbers. The parasites still infest the herds, but the stock show but slightly any ill-effects. A mob of 334 Sturt's Creek cattle experienced a loss of 40 head in travelling through to Wyndham; but with this exception, none but ordinary station losses have been reported.

Reports from the Eastern Goldfields state that the regulations for the disinfection of trucks used in the conveyance of tick-infested cattle to those centres are strictly enforced, and that, up to the present time, there has been no appearance of the parasite among the local cattle. There are 160 head of dairy cows at Coolgardie and Kalgoorlie, most of which come in contact with the country travelled over by the infested cattle; and, although these are regularly inspected, they show no sign of ticks. The Goldfields Inspector has failed to find ticks on any hides other than those of cattle sent to the fields under quarantine for immediate slaughter. Mr. Nathan has tried to breed the cattle tick at Coolgardie artificially, but failed. He considers the climate too arid.

The Lambing.

From reports and other information to hand, the lambing this season will be very indifferent throughout the State; and it is questionable whether the flocks will be increased when the losses among the grown sheep are taken into account. In the North, the lambing has been very patchy, some stations recording a fair increase, while others have experienced a difficulty in keeping the ewes alive. In the South-Western districts the pastures are rapidly improving, and, as the bulk of the lambing is fortunately late, a better return may be experienced; but the flock losses have been heavy owing to the drought. Broomehill started lambing in April, and completed with a 40 per cent. return, this station being much earlier than others.

Testing of Dairy Cows.

Despite the comparatively small number of tuberculous cattle condemned by the Department during the year, I am still of opinion that a large number of cases exist among our dairy herds which do not come under our notice, and, with a view to dealing more effectively with these, I recommended last year the compulsory testing of all cows supplying milk for sale, at stated intervals. At the time, I was under the impression that power could be given to carry on this work by regulation under "The Stock Diseases Act, 1895," but on referring the matter to the Crown Law Department it was ascertained that the provisions of the Act could not be extended in the manner required. The Crown Law officers pointed out, however that by-laws could be made under the Public Health Act, by which only the milk of certificated cows could be sold, and I understand the health authorities have this matter under consideration at the

present time. Should the Health Department adopt the measures proposed, they will be afforded all the assistance possible from the officers of this Department.

Central Public Abattoirs.

I must again draw attention to the necessity for the erection of public abattoirs, so that increased supervision may be exercised over the meat supply. The same difficulty still exists in the inspection of meat going into consumption, owing to the number of small private slaughterhouses established in various suburban localities, and until the whole of the slaughtering is confined to one area it will be impossible to carry out this work with any degree of satisfaction. As I have previously pointed out, the Department does not pretend to supervise the slaughtering of stock at private slaughter-houses, as, with the staff at my disposal, it would be impracticable. Even if we had double the number of inspectors, it would be impossible to maintain a satisfactory system of inspection at all suburban slaughter-houses, as they are scattered over such a large area, and there are no regulated hours of slaughter. That there must be a number of cattle passed into consumption at the present time which should be condemned on account of tuberculosis I frankly admit, and I have stated so time after time, but until the abattoirs are constructed in accordance with my recommendations made as far back as the year 1896, the present inadequate system of inspection must continue. In every State of the Commonwealth we have evidence yearly of the large percentages of carcases destroyed on account of disease in the central abattoirs, and when we consider that a large proportion of our meat is supplied from the Eastern States, and it may readily be assumed we do not import the choicest beasts procurable, it must be patent to all that something like ten per cent. of the carcases at present going into consumption are more or less diseased. This is by no means a new subject in my annual reports, and I sincerely trust that effect will be given at an early date to my oft-repeated proposals to centralise our slaughtering.

J. M. CRAIG,

Chief Inspector of Stock.

RABBIT DEPARTMENT.

Report of the Secretary of the Rabbit Department.

The Hon. the Minister for Lands.

Sir,—I have the honour to submit my first Annual Report upon the working of the above department during the year ending the 30th June, 1902.

This department commenced operations as a separate branch at the beginning of September last, all work in connection with coping with the incursion of rabbits previous to that date having been under the direction of the Stock Department.

Staff, and how employed.

On taking up the duties of the administration of the department, the writer found a staff already at work in the rabbit-infested districts, consisting of five sub-inspectors, under the control of Mr. Inspector White. The work chiefly carried on up to that time had been locating the existence of rabbits, and doing everything possible with the means at the officers' disposal towards the destruction of the same. In the former direction good work had doubtless been accomplished, but the endeavours of such parties to stem the tide of a widely-scattered invasion over such a vast extent of country were naturally futile, and probably only led to a wider dispersion of the rabbit colonies against which their efforts were directed. The services of two of the sub-inspectors were consequently dispensed with, and the remaining officers were withdrawn from the infested area, and were employed in carefully ascertaining the most westerly limits of the vanguard of the invasion at different points, and also in investigating reports of the presence of rabbits as they from time to time arose in various parts of the State. Their services were further availed of in the important work of locating soakages along the proposed fence line, and, latterly, in overseeing fence erection and in putting down wells for use in the construction of and maintenance of the fence.

Rabbit Literature.

From the Stock Department was handed over to me a voluminous mass of correspondence—the accumulation of years—bearing upon the rabbit question, received from all parts of Australasia, from Great Britain, and America. Among it is to be found information and suggestions supplied by men who have undoubtedly acquired a good practical knowledge of the subject in the Eastern States; on the other hand, the writers who proffer antiquated fencing suggestions, and extravagant and almost Utopian schemes for rabbit extermination, are most prolific. The report of the Royal Commission, which sat in Perth in the beginning of last year to consider

the rabbit question, affords most interesting reading, and the decisions arrived at as regards fencing and the rabbit invasion generally—as shown in the recommendations made by the Commission to Parliament—accord with the views held by men who are in the best position to judge of this momentous question.

Rabbit Destruction by Disease.

Among the interesting matters which the files for the year show to have arisen is a question whether the destruction of rabbits might not be brought about by the transmission to them of a disease which was supposed to be carrying off the opossums in certain districts of the State. The inquiries made, however, did not at all show conclusively that the disappearance of these marsupials was due to death from any disease; no evidence was forthcoming of any sick or dead opossums being seen, and no disease was found to be present in the animals submitted for scientific examination. Experienced bushmen, evidently of keen observation and intelligence, attribute the decrease in opossums to various causes—viz., their migratory habits, hunters, bushfires, etc.—and these seem to have been the only explanations forthcoming. It is not uncommon, as I know from personal observation in other parts of Australia, for opossums to gradually disappear upon the advent of settled population. Further investigations are, I understand, at present being made by the Stock Department in this matter. After all, past experience makes it appear very doubtful whether a transmissible disease would be of any practical value in ridding Western Australia of the rabbit. In those parts of New South Wales and Queensland where the pest abounds, the efforts in this direction have so far come to naught, and it seems scarcely probable that in such a (as yet) sparsely infested country as Western Australia the remedy would prove more successful. The bonus offered by the New South Wales Government of £25,000 to any one who would successfully introduce an effective means of rabbit extermination induced Drs. Loir and Gremont, of the Pasteur Institute, Paris, to conduct lengthy experiments in that colony with a view to obtaining the reward, but nothing came of it. Similarly, Mr. Pound, the Government Bacteriologist of Queensland, went to unlimited trouble in his efforts to disseminate chicken cholera among the rabbits at Diltopper and other stations, but in the end it was generally pronounced to be impracticable, and that ordinary poison was as effective, simpler, and cheaper. As far as it went, the introduction of the microbe was successful; the rabbits took the disease, and they even communicated it to one another so long as they were in close contact; but, finding his companions sickening and dying, the artful bunny recognises that something is wrong, and, with a wisdom usually ascribed to another rodent, deserts the establishment—in other words, the healthy ones scatter before falling victims to the microbe, and the disease soon burns itself out. This was the case, too, with the famous "Tintanalogy" disease, which broke out in 1888, and for a time carried off some thousands of rabbits among the thickly-populated warrens; but it never spread to the adjoining

runs. Human agency would appear to be necessary for its thorough distribution, and more skill is required in this than the average bushman has the patience to exercise. The offer of the New South Wales Government resulted in over 2,000 inventions being tendered by claimants for the bonus; but, so far, none have succeeded in earning the reward.

Advance of the Rabbits.

During the 10 months which the department has been in existence, I have been in frequent receipt of reports from different parts of the country announcing the discoveries of rabbits or of rabbit tracings. The first was on the 11th September last, reporting a rabbit caught at Edjudina and others seen at Mulgabbie. Following that came information, on the 16th September, that a rabbit had been caught near Coolgardie; on the 19th, that traces were visible at Penny's Lake, and also near Bulong; and on the 23rd, that a rabbit was killed one and a-half miles from Kanowna. On the 3rd October a wire informed me that five young rabbits had been found near Southern Cross. As I was in the neighbourhood of Southern Cross the following day, examining part of the route of the proposed fence, I went on to the spot and received ocular proof of their existence. On the 5th October I received instruction from the Hon. the Minister for Lands to inquire into a report of two rabbits having been seen at Parkerville, on the Darling Range. In company with Mr. Inspector White, I investigated the matter thoroughly, but found that there was nothing in it. A report of rabbits near Rockingham a fews days later proved equally groundless. The 26th November brought word of rabbits being caught at Mulgabbie, and on the 7th December three young ones were killed and an old one seen at Kanowna. On the 16th December word reached me of the first appearance of rabbits in Esperance. About the same date I was informed that rabbits had been discovered at Nannine, and received rabbit droppings from there in proof of the statement; this has since proved not to be such a serious matter as it at first appeared, being a case of a small isolated colony which prompt measures effectually extinguished. Recently a report has been received from one of the sub-inspectors of his having found traces of a few rabbits along an old road in the vicinity of the fence line at Emu Rocks, about 93 miles southward from the railway line. With our knowledge of the rate at which rabbits advance, this is hardly more than was to be expected, and the late date at which we have been enabled to get the fence erection under weigh will necessitate extreme vigilance and a constant warfare to keep down the vanguard of the invasion, so as to prevent the rodents obtaining a footing west of the fence-line before the barrier is complete. I have little doubt that these traces will prove to be those of an odd two or three rabbits that have shot far ahead of the rest, and that we shall soon succeed in exterminating them. Information, however, is forthcoming from time to time showing the resistless advance and steady increase of the pest, and it is now generally

recognised that the rabbits have secured a good footing throughout the Coolgardie Goldfields districts, and from there southward to the coast, a little to the westward of Esperance. The natural incursion is no doubt assisted in some instances by men who think they are doing themselves and some others a good turn by helping the rodents along, and we are not without evidence of the overlander having made use of his billycan to carry a nest of young rabbits from the infested districts near Eucla to the clean country further westward.

Rabbit-proof Fencing.

It is now nearly twenty-three years since public money began to be expended in Australia upon rabbit destruction, and the experience of that long period of time has shown that no efforts in coping with the pest are of any material avail without fencing; hence, no doubt, the decision to erect a main barrier fence to block the oncoming wave, and save the Western portion of the State from the dreaded invasion. Early in September a flying survey of that portion of the proposed line of fence between the Eastern Railway line and the Southern Coast, at Starvation Boat Harbour, was completed by Mr. Surveyor Canning, accompanied by Mr. Inspector White, of this department. The result showed a practicable route for such a fence well ahead of the rabbits; indeed, the route chosen has since proved to be the best that could possibly be selected for the purpose, when the natural features of the country are considered. It has the advantage of being the shortest possible, it avoids difficult country which elsewhere exists, is well away from the lines of traffic, and appears to be good sinking almost throughout. There seems every hope that water will be obtainable by sinking at intervals along the line of fence, and the chief drawback is the scarcity of suitable timber for fencing purposes, necessitating the use of iron standards for about 160 miles of the central portion.

Immediately after the receipt of Mr. Canning's report, I paid a visit of inspection to the northern portion of this fence line, and made an examination of the timber there available, to enable the drawing up of suitable fencing specifications. It was while engaged upon this work that I learned what headway the rabbits were making westerly along the railway. The seriousness of this advance led me to recommend that as soon as possible the fence be begun at the railway line, the first two sections to run twenty-five miles on either side—that is to say, southward and northward respectively from the railway line. This was obviously the first step to be taken, as the well-known tendency of the rabbits to follow lines of traffic and well-grassed clearings, such as the old Coolgardie and Southern Cross Road and the railway afforded, made it appear highly probable that the first point of the fence line to be challenged would be about this spot. Accordingly tenders were immediately called for the wire material necessary to complete the above fifty miles, and on the receipt of the same, further tenders were called for the erection of the two sections of fencing referred to. Twelve tenders were received for the southern section, and six for the northern;

the lowest tender for the former being £41 per mile, and for the latter £63 9s. per mile. As no permanent survey had up to that date been made of the northern section, some doubt prevailed regarding the facilities for carrying out the work on that portion, and this probably accounted for the comparatively small number of tenders, and the high rates demanded for the erection of the same. It was decided to accept the lowest tender for the southern section, and to call fresh tenders for the northern. The first work of erection was accordingly begun about the 21st December.

Early in November I was instructed to prepare particulars of material likely to be required for rabbit-proof fencing to protect the South-Western portion of the State, and on the 8th of that month a list of the same for the completion of the fence from the sea at Starvation Boat Harbour to a point one hundred and fifty miles north of the Eastern Railway line, together with a surplus supply for probable settlers' requirements, was submitted and temporarily approved by the Hon. the Minister for Lands; but owing to the political unrest which prevailed immediately afterwards, and the absence of any settled Minister from office, further action was suspended for some months, and it was not till the 24th February that I was able to proceed with the calling of tenders for the supply mentioned. In the meantime, the tenders of Messrs. Geo. Wills and Co. for netting, and of Herbert T. Wright for wire, had been accepted for the construction of the two sections, northward and southward respectively, from the railway line. On the 4th of March the advertisement appeared in the *Government Gazette* calling for tenders for 483 miles of wire netting, 70,500 iron standards, and about 133 tons of wire, resulting in the tenders of Messrs. Lysaght Bros. & Co. for wire netting, J. Barre Johnston & Co. for standards, and Geo. Wills & Co. for wire, being accepted. For the erection of the second section of 25 miles, the calling of fresh tenders was delayed—owing to the impossibility of getting early delivery of the netting—until the 11th April. The lowest tenderer for this section proved to be H. Cocking, at the rate of £44 19s. per mile, and the work is now under weigh. The first consignment of netting, which was expected by the end of May at the latest, has been further delayed owing to an accident to the vessel on which it was shipped; it has consequently not yet arrived, and its absence is causing some inconvenience.

Description of Fence.

Judging from the correspondence in the files for the year, much diversity of opinion would seem to exist as to the kind of fence most suitable for checking the rabbits. This matter has been pretty well threshed out in the other States, and we have the many years of experience of at least five other States to guide us. The aim is to secure the maximum of efficiency at the minimum of cost, and that seems to be most nearly obtained in a fence with twelve-feet panels, carrying netting of which six inches is in the ground and three feet out of the ground, attached to three wires, the top (fourth)

wire of the fence being two inches from the top of the post, which stands four feet out of the ground. The description of netting which is by far the most largely in use at the present time is that having a width of 42 inches, mesh $1\frac{1}{2}$ inches, and of 17 gauge of wire; and this no doubt fulfils all ordinary requirements. For a main barrier fence, to stem the heavy wave of rabbits, where three and four weeks old litters are numerous and pressure on the fence at all parts ever present, the inch and a quarter mesh is, without doubt, to be preferred; at the same time, the upper portion of such netting, which young rabbits have no possible chance of reaching, is unnecessarily close, heavy, and, of course, expensive; and if a netting were procurable in which the lower portion is of $1\frac{1}{4}$-inch mesh, and the upper portion a size larger, woven all in one piece, this would appear to have the desired maximum of effectiveness with the minimum of cost. From careful observation while supervising the erection and the maintenance of many hundreds of miles of fencing of both meshes, I felt satisfied that no netting would be more serviceable than the combination named, and was given to understand by the various manufacturers' agents that such a netting could be manufactured; accordingly, in the specifications calling for tenders for netting, provision was made for the tenderers offering this description as an alternative to the uniform $1\frac{1}{4}$-inch mesh. The result, however, proved unsatisfactory, the samples of combination netting furnished were not up to the required standard, and circumstances enabled the colonial manufacturers to quote an even lower price for the uniform $1\frac{1}{4}$-inch mesh. Netting of different meshes applied in separate strips I am not in favour of; besides the extra labour, there is always a certain amount of weakness just at the part requiring the most strength, and any impact, such as might occur during willy-willies, or from vermin (and I have seen wallabies burst right through the $1\frac{1}{2}$-inch by 17 netting, and iguanas and dingoes tug it out of all shape) might readily displace the contiguous selvages sufficiently to allow the ever-prying rabbit to poke his way through. Advocates of this kind of netting claim that it possesses an advantge in the event of it becoming necessary to renew the bottom portion owing to deterioration through the action of chemicals contained in the soil, etc. In this I can hardly concur; and experience tells me that the renewing of the bottom portion of the netting can be done more easily and quite as effectively if the original netting is woven in one piece throughout.

The desirability of adopting long-panel dropper fencing has been brought a good deal under my notice of late, but while recognising its excellence for ordinary stock purposes, the objections to its use in a rabbit-proof fence are, I consider, almost insurmountable. Among these is the tendency to sway, and upon impact to "give," thereby straining and weakening the netting where it enters the ground; the impossibility of maintaining the netting (or any division of mesh in it) at a uniform height above the ground necessitating a large amount of extra netting attachments above and below the standing netting; whereas the short-panel fence responds

more readily to the irregularities of the ground, and is more rigid. In the State of Queensland, where the fences are erected on the lines proved by long experience in the Southern States to be the best, long-panel rabbit-proof fencing is never used nor approved of. Neither has it been adopted, except in rare cases, in New South Wales.

Maintenance of Fence.

To leave a fence to look after itself when erected would simply be to throw the money spent in erection away, and much that we hear in condemnation of fencing as a means of checking the rabbit arises from instances where this neglect has been allowed. One who has never had to supervise the maintenance of a rabbit-proof fence can form no idea of how soon it lapses into ineffectiveness if not closely watched and tended, and a week's neglect on the part of the boundary rider is plainly manifest to the visiting inspector in the signs of disrepair. It is therefore most essential that a reliable class of men be engaged in this important duty. The length allotted to each man to look after will depend a good deal upon local conditions; usually about 30 miles—though in some places even up to 50 miles—can be placed under the care of one man. From what I know of the local fence line, I should say that 40 miles would not be too great a length for each boundary rider—for the first year or two at least. It will probably prove to be necessary, as it has in some other parts, to supply certain boundary riders with bicycles, to enable them to carry on their duties effectively throughout the dry seasons of the year.

Probable Cost of Fence.

The cost of rabbit-proof fencing has been increasing, rather than otherwise, during recent years, owing to the gradual advance in the price of wire material; and in this State where the rates ruling for labour, and particularly for cartage, are so high, compared with what they are in the Eastern States, where water and grass are more plentiful, the rate per mile will necessarily be correspondingly high. Within some fifty miles of the railway line, or of the seaboard, this might be reckoned to average about £80, but the less accessible portions of the line, and especially where the use of iron standards is compulsory, it is likely to be fully £10 a mile higher.

Assisting Settlers with Wire Netting.

In the Rabbit Act which I have prepared, provision is made for assisting settlers with wire netting, delivered at the nearest railway station or shipping port; the cost of the netting to be repaid to the Government, together with interest at the rate of four pounds per centum per annum, in twenty equal instalments.

Western Australia's Liability to Invasion.

I have frequently heard it stated during the last year that rabbits will never "do" in this State. The reasons given are

many, and to the uninitiated no doubt appear sound. For my own part, I can see no safe grounds on which to found such hopes. The argument most stoutly maintained by some is that the matter has already been proved over and over again: that rabbits have been introduced at various points along the coast, that they have been known to exist for years in different localities, yet never made any headway; in fact, have gradually disappeared. That is very probable, and the experience is not peculiar to Western Australia alone. I could point to places in New Zealand and in Victoria where I have seen the same thing, and I know it to have occurred in more than one part of New South Wales, yet at each of these places the true acclimatised colonial rabbit eventually got the upper hand, and defied all local conditions to prevent increase. I do not maintain that rabbits would be likely to overrun and monopolise possession of every portion of this State alike, and that there are absolutely no places in which they would not flourish to excess; certain conditions—of soil and cover chiefly—are not generally favourable to their development, as witness Gippsland, in Victoria, and other places. There are parts of New Zealand where, of my own knowledge, rabbits have been in existence for more than 20 years; nothing has ever been done to exterminate them, they are still there, yet have never become a nuisance; but in the greater part of Western Australia I venture to believe they will find a very congenial habitat, and in no part more so perhaps than the pastoral country in the Western and North-Western Divisions. It very often occurs that a small colony of rabbits will, after struggling for existence for years, eventually get wiped out by their natural enemies, but should conditions once arise which prove favourable to a greater access to the adult rabbit population than the natural enemies are equal to overcoming, then it is "good-bye" to their extinction.

The arid nature of a large portion of the country and the absence of water is advanced as another reason why the rodents will never prosper here. It is true that where rabbits are in the habit of having access to water, and the water supply fails, they perish for want of it; on the other hand, the rabbits that do manage to survive in dry waterless country (for there is always a small proportion), and succeed in propagating their species in such country, can, with their progeny—like many other animals born into such conditions—exist on a very limited supply of moisture.

There is the further hope that the poison weed will prove an effective safeguard. No doubt, on making their first acquaintance with this plant many rabbits will come to grief, but such is the cuteness of the rodent that, where they have a choice of food, I shall not be surprised if they soon learn to avoid that which proves fatal to them. This is one of the difficulties encountered in using poison for their destruction. The present day Australian rabbit has proved himself to be possessed of an intelligence and adaptability little dreamt of in his old-country prototype, and it is this fact which makes the enemy we have to fight against so formidable a one.

Position of Work at Date.

Fencing Contract No. 1.—This section of 25 miles southward from Burracoppin is cleared, and the 4-wire fence completed to within two miles of the terminus, with the exception of the wiring of about three miles. The netting for attaching to this section is on board the German mail steamer "Karlsruhe," due at Fremantle on the 6th of July.

Fencing Contract No. 2.—Being a section of 25 miles running northward from Burracoppin. The clearing is completed for 14 miles, and two miles of straining posts cut and delivered on the line.

Railway Barrier.—A pit has been constructed beneath the railway track where the rabbit-proof fence crosses the railway line, to form a barrier to rabbits attempting to make their way along the railway line.

Water Facilities.—About 37 miles along the fence line southward from Burracoppin a well has been sunk to a depth of 20 feet, providing a good supply of water. The well has been timbered and fitted with windlass and trough. At King Rocks, about 78 miles south of Burracoppin, another well has been sunk to a depth of 50 feet, providing a good water supply. The same has been timbered and fitted with windlass and trough. At Emu Rocks, about 93 miles south, steps are begun to make an excavation in a rock suitable for holding a good supply of water, none being obtainable by sinking.

A telegram is just to hand from Mr. Inspector White, at Ravensthorpe, reporting upon the advance of the rabbits upon the fence-line. He has thoroughly inspected the country up to 20 miles on either side of the line, and finds that the traces discovered at Emu Rocks are those of an isolated colony of a few rabbits, which every effort is now being made to eradicate.

I have, etc.,

H. M. WILSON,

5th July, 1902. Secretary, Rabbit Department.

WHAT FRUIT TO GROW.

By A. Despeissis.

The following chapter contains a carefully-selected list of fruits which have either been proved to be successfully grown in the S.W. division of Western Australia, or are known to thrive in other fruit-growing countries bearing with ours strong features of similarity as regards those natural conditions which are congenial to fruit trees.

The letters E. and L. mean early or late, respectively, and S., A., and W. denote summer, autumn, and winter.

Plant Breeding.

Until a few years ago the art of man had seldom been directed towards improving our cultivated plants. Seeds were collected of varieties exhibiting special features deemed worthy of reproduction and improvement. These were planted under favourable conditions and received the benefit of careful cultivation; the rest was left to Providence. Under such circumstances, a great many of our choicest select seedlings, varieties of fruit trees, and plants have originated; a great many more are the result of chance seedlings. This process however is, if at times efficacious, somewhat empirical, and some of our more modern fruit growers have of late brought their commercial genius to bear in selecting and in mating varieties embodying special features which, when blended together, would approach closer to the ideal they have set themselves to create. Time is thus saved, and if the result does not always come up to that ideal, it often constitutes a subject which is worth putting to the test and which is finally adopted or rejected by either the breeder himself or by the cultivator.

Pollination.

This is effected by the process of cross fertilisation or of pollination. For so doing something must be known of the structure of the flower. Inside the corolla, which is formed of the variously-coloured petals, are the organs of fructification of the plant. These consist of a pistil, so called because it somewhat resembles a pestle, and which includes an inflated tip or stigma which receives the pollen, a style or miniature tube which conveys the pollen to the ovary, which in the course of development becomes the fruit. They also consist of thread-like bodies called stamens, which are the male organ of flowers and surround the pistil. These organs secrete the pollen or fecundating dust which is contained in little capsules called anthers.

The appliances necessary for cross-fertilising plants are a pair of long-pointed scissors, a pair of tweezers, a magnifying glass, and paper or gauze bags.

Soon after the blossom opens the petals of the corolla may be removed; the stamens which surround the pistil are excised on those flowers of the plant it is intended to use as the foster-mother of the

new variety, and the paper bags, whose edges are damped slightly, are tied on the twig supporting these organs. This done, the blossom on the parent tree which is to supply the pollen is watched with the aid of the magnifying lens, and as soon as ever the pollen sacs are seen to begin bursting, these flowers may be cut, seized with the tweezers, and after carefully lifting the paper bag from the blossoms with the male organs excised, they are gently rubbed on the exposed pistils; the covering bags are then fastened on again and left to remain for a few days until the setting takes place.

Pedigreed Fruit Trees.

The individuality of the tree having been secured, either accidentally or owing to the foresight and the experience of the breeder, it can be transmitted and preserved with a fair amount of permanency. Some strains of cattle and live stock are well known which embody to a high degree of perfection all the good points of the breed, whilst other strains are also known to have thrown back and degenerated and to only beget mongrels; so in our orchards there are strains of vigorous and feeble trees bearing, some heavily, others lightly. This being admitted, it behoves all nurserymen and fruit-growers to only propagate from the most productive and the best of trees. After individual trees seemingly inferior to the accepted standard have failed to improve under the stimulus of cultivation, manuring, suitable pruning, and requisite treatment directed against the eradication of pests on the removal of unhealthy surroundings, there is but one thing left to secure the rising of that tree up to the desired standard, and that is to cull it out and work on it a scion from some selected strain.

POME TREES.

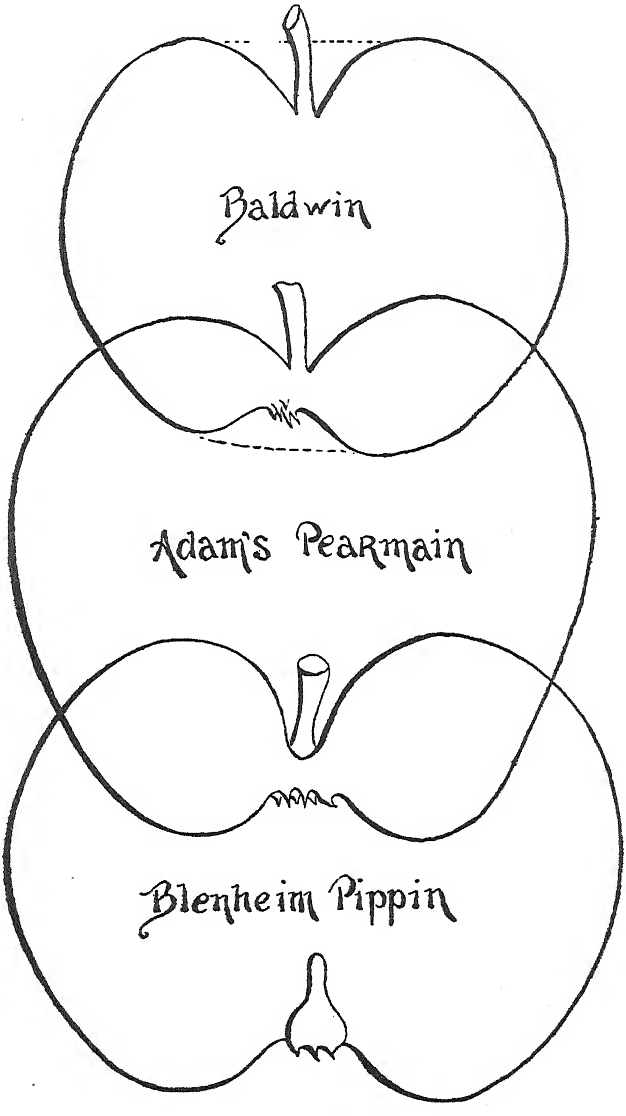
These are commonly meant to comprise fruit grown from pips, such as apples, pears, and quinces.

They were some generations past known by country folk as pippins, pearmains, russets, costards, codlins, and so on.

Pippins were chance seedlings which were in themselves so perfect that they did not require grafting or budding. Pearmains were somewhat elongated or pear-shaped. Russets were covered with a rough skin, and were generally sorts which hang well to the trees. Costards were large and bulky apples, whereas codlins were apples which fell to the ground when green, and were chiefly used for cooking, sauces, etc. Cider apples exemplified those apples —some astringent and some bitter—which were best adapted for the manufacture of cider.

So with pears. We have Beurrés, Bergamottes, cooking, and perry pears.

Beurrés are melting, juicy pears, which at one time were thus distinguished from hard cooking sorts. They vary widely as regards shape, period of ripening, markings, and for that reason the old classification has not been maintained, each of the Beurrés


Baldwin
Adam's Pearmain
Blenheim Pippin

being qualified by its patronymic name. Bergamottes once included a fair number of pears, each being differentiated by a specific name, while perry pears included those most suitable for fermenting into perry.

Apples *(Pyrus Malus).*

There are over 1,500 varieties of apples catalogued by nurserymen. Of these, the following suit our requirements and climatic conditions best. Of summer apples, plant only a few. They should be worked on Northern Spy stock, preferably to any other. Do not plant deeply, lest the variety worked upon the Spy should throw its own roots, and become blighty and ultimately useless. They are named as much as possible in the order they ripen.

Early Margaret (syn. Red Juneating) S.—The earliest of all apples, ripens before Christmas, but will not keep, and soon becomes mealy. Fruit small, roundish, ovate, and narrowing towards the eye, where it is angular, yellow greenish on shaded side, bright red next the sun, striped with darker red; a few grey russety dots.

Red Astrachan (of Russian origin), S.—A very early, abundant bearer, ripens towards Christmas and the New Year. Tree vigorous. Good for market on account of its rich colour. Fruit of second-rate quality, and must be gathered at the right time or else turns mealy.

Mr. Gladstone, S.—Ripens with Red Astrachan. Small, oblate, highly coloured, handsome and good, will not keep.

The last three sorts named ripen from the 20th December to the 10th January; they require gathering every few days, otherwise they fall.

Irish Peach, S.—Ripens in January, good bearer, but not a keeper; does not blight. Fruit medium size, somewhat flattened and slightly angular. Pale yellowish-green, tinged with dull reddish-brown, and lively red thickly dotted with green dots on shaded side and yellow spots on sun side. Flesh greenish white, tender, crisp.

Lord Suffield, S.—A valuable, early, English cooking apple, excellent for jelly making; described as an improvement on Keswick Codlin. Should be shipped in February. Tree an early and very prolific bearer, and one of those varieties which, on account of these properties, is not long lived. Fruit large, conical, pale greenish-yellow, with a brown tinge on the sunny side. Flesh white, firm, tender, brisk sub-acid.

Gravenstein (of German origin), S.—Ripens in February. Tree very vigorous, spreading. Young shoots reddish brown; very productive, an early bearer. Fruit fairly large, roundish flattened, pale waxen yellow, pencilled and marbled with red and orange on the side next the sun. Flesh tender, crisp, high flavored, aromatic. One of the best qualities of apples grown, requires frequent picking

over as they colour. Moderately good keeper, but hardly good enough for shipping to English market.

Emperor Alexander, A.—A very large showy, cooking, and early variety. Tree vigorous, spreading, productive, and when grown as a dwarf, producing fruit of the largest size and greatest beauty, greenish-yellow, few streaks of red on shaded side, and orange-streaked with bright red on the side next to the sun, covered with numerous russety dots. Does well in the cool districts.

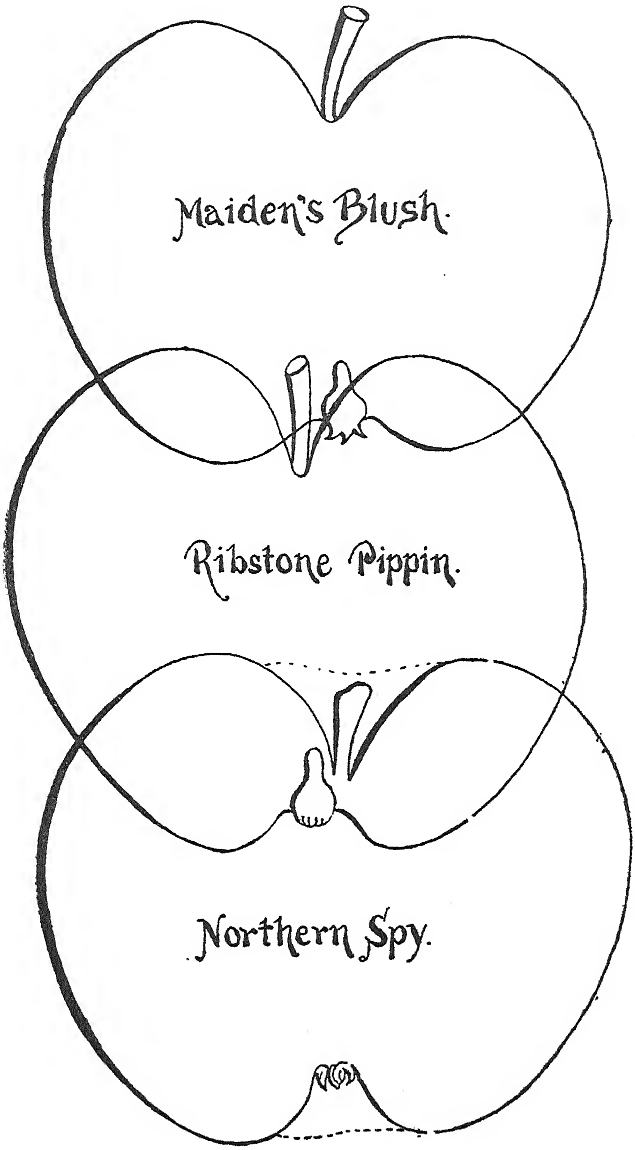
Reinette de Canada, A (Normandy).—Ripens early autumn. Tree vigorous, with an open, spreading head, very productive; young shoots, clear reddish brown, slightly downy. Succeeds well wherever planted; large oblate, rather irregular with projecting ribs. Fruit yellowish-green, tinged brown on side next the sun, sprinkled with dots and russet patches. Flesh nearly white, rather firm, juicy, with a rich, lively, sub-acid flavour. Keeps very well; an apple of first-rate quality, either for culinary or dessert use. The finest fruits are produced from dwarf trees.

Cellini, A.—A culinary apple of the first quality, firm and showy, somewhat like the Nonesuch. Fruit rather above medium size, roundish and flattened at both ends. Skin rich deep yellow, with spots and patches of lively red on the shaded side, and bright red, streaked and mottled with dark crimson next the sun, with here and there a tinge of yellow breaking through. Eye large and open in shallow, slightly plaited basin, stalk very short in funnel-shaped cavity.

Trivett's Seedling, A.—An Australian blight-proof seedling. Early, regular, and heavy bearer. Fruit medium size, oblong and slightly ribbed, covered with red and striped with darker red. Requires thinning. One of the first apples ready for shipping.

Ribston Pippin, A.—One of the finest English dessert apples. Ripens in the autumn. Tree forms a spreading top, is in general hardy, a vigorous grower, and a good bearer, provided it is grown in a dry soil; but if otherwise, it is almost sure to canker. Fruit medium sized, roundish, and irregular in its outline. Skin greenish-yellow, changing to dull yellow, marked with pale red streaks, which become deep crimson on sunny side, and russety patches over the base. Eye small. Flesh yellow, firm, crisp, rich, and sugary, charged with a powerful aromatic flavour. Fairly good keeper. This is one of the first apples we have ready for shipping—ripens end of February. Like Gravenstein, wants suitable soil and climate to give good results. Better suited for cooler districts. Subject to woolly aphis.

Jonathan (New York), A.—Ripens in the autumn, from first week in March, and keeps till midwinter. Tree hardy, moderately vigorous, forming an upright, spreading, round head; early and abundant bearer, young shoots rather slender, slightly pendulous, greyish brown. Fruit medium to large, roundish, conical or tapering to the eye, even and regular in its outline, eye closed, skin thin and smooth, clear light yellow ground, mostly covered with red, deepening in the sun; flesh white, very tender and juicy, rich, vinous.


Maiden's Blush.
Ribstone Pippin.
Northern Spy.

Succeeds wherever grown, and proves one of the best in quality and most profitable, either for table or market.

Ben Davis, A.—Tree very hardy and free grower, with very dark reddish-brown, slightly greyish young wood forming an erect round head, bearing early and abundantly, and blooming late in spring. The apples grow close to the limbs, which are on that account not likely to break down. Fruit medium, sides often unequal; light red and deep red on yellowish ground, dotted with russet dots. Recommended for dry, warm districts.

Yellow Bellflower, A.—Large, handsome, and excellent dessert apple; oblong, a little irregular, tapering to the eye, skin smooth, pale lemon yellow, often with a blush next the skin, stalk long and slender in a deep cavity, calyx closed, set in a rather narrow plaited basin. Seeds in a large hollow capsule or core. Tree moderately vigorous, spreading, a regular and good bearer; thrives well in sandy soils.

Adam's Permain, A. to W. (England).—Ripens in the autumn. Tree a free and healthy grower, producing long slender shoots, by which and its spoon-shaped ovate leaves, it is easily distinguished. It is an excellent bearer in cool districts, even in a young state, particularly on the Paradise or doucin stock, and succeeds as well on espalier, a good exporting variety. Fruit large, pearmain-shaped, very even and regularly formed. Skin pale yellow, tinged with green, covered with russet on shaded side, but deep yellow, tinged with red and streaked with livelier red on sunny side. Flesh yellowish, crisp, juicy, rich, and sugary, with an agreeable and pleasantly perfumed flavour.

Cox's Orange Pippin, A. to W.—One of the best dessert apples. Ripens in winter. The tree is well adapted for dwarfs, and a free bearer. Fruit medium sized, roundish ovate. Skin greenish-yellow, and streaked with red in the shade, but dark red when exposed to the sun; patches of ash-grey russet forming a smooth crust, eye small, set in a shallow saucer-like russet basin; stalk somewhat fleshy, set in a moderately deep cavity covered with russet, and with a slight swelling on one side. Flesh yellowish, tender, crisp, juicy, and sweet, with a fine perfume and rich flavour.

Bismark, A.—A fine showy Victorian variety, good either for cooking or dessert. Keeps fairly well. Tree strong grower and early bearer.

Cleopatra, W. (syn. Pomeroy, New York Pippin).—One of the best for dry districts. Keeps and carries well. Dessert or cooking. Tree grows large and bears well. Fruit ripening in winter, rather large, of an oblong figure, rather irregular in its outline, and with five angles on its side, forming a kind of lip at the crown; eye closed. Skin greenish yellow, few green specks intermixed with a thin grey russet, and tinged with brown on sunny side. Flesh firm, crisp, tender, juice plentiful, sweet, with a slight aromatic flavour. Does well on ironstone gravel slopes. Affected by "bitter pit" when grown on moist, badly-drained soil.

Five Crown Pippin (syn. London pippin), W.—Dessert and cooking, drying, or cider. Ripens in late autumn and keeps sound late, showing no symptoms of shrivelling. The tree attains about the middle size, is not a strong grower, but quite hardy and clean, and an excellent bearer. Fruit medium to large, angular in its outline, and much ribbed round the eye. Skin smooth and shining, lemon-yellow on the shaded side, and with a bright red cheek on the side next the sun; a few russet dots, eye large and closed. Flesh crisp, tender, juicy, and richly flavoured with a brisk acidity. Not suitable for warm, dry localities.

Esopus Spitzenburg (New York), W.—Tree an upright grower, with long slender shoots; healthy. Fruit keeps fairly, seeds in a hollow core, large, oblong, tapering roundly to the eye; skin smooth, covered with rich, lively red, dotted with distinct yellowish russet dots, and on shaded side yellowish ground with streaks and broken stripes of red; stalk rather long and slender; eye small and closed; flesh yellow, rather firm, crisp, juicy, with a delicious rich, brisk flavour; considered equal to the Newtown pippin. Bears well while young, but does not live very long unless well cultivated and carefully sprayed to ward off the attacks of fungoid diseases and of insects. Requires liberal manuring. Subject to "bitter pit" disease.

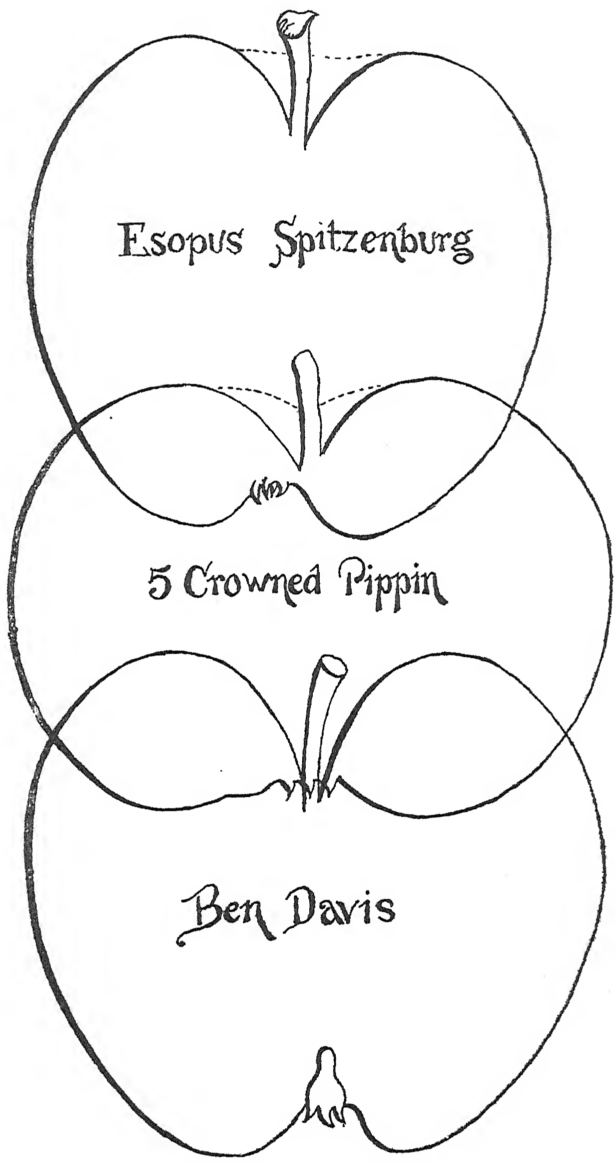
Rome Beauty, W.—Ripens early winter. Tree a good grower, late bloomer, productive. Young wood, clear reddish brown, slightly downy or grey. Fruit large, to very large, roundish, yellow, shaded and striped with red, sprinkled with light dots. Flesh yellowish, juicy, sprightly; core rather large, fruit keeps late. Tree bears early, subject to woolly aphis. Does well on deep, heavy loam.

Maiden's Blush, W.—Ripens early winter. Tree of rapid growth, with spreading head, and bearing large crop of fruit of medium size, very regularly shaped. Skin of a delicate waxy appearance, pale lemon yellow in the shade, with a bright crimson cheek next the sun; eye closed; flesh white, tender, sprightly, pleasant, sub-acid. Cultivated and admired for table, cooking, and market, and also for drying.

Scarlet Nonpareil, W.—A good English sort. Tree hardy on well-drained soil (rather subject to woolly aphis), a good grower, though slender in its habit, and a very good bearer. Fruit medium sized, round, narrowing towards the apex, regularly shaped, should be thinned out. Skin yellowish on the shaded side, streaked with pale red, but covered with red, which is streaked with deeper red on sunny side, and covered with patches of russet and large russety specks. Flesh yellowish-white, firm, juicy, rich, and sugary.

Prince Alfred, W.—A large, excellent dessert or cooking apple, showy, much liked in Tasmania; a good keeper.

Blenheim Orange, W.—Fruit, good size, globular, and somewhat flattened, broader at base than apex; skin, yellow, with a tinge of dull red and streaked with deeper red; eye, large and open


Esopus Spitzenburg
5 Crowned Pippin
Ben Davis

n a deep basin; stalk, short and stout; flesh, yellow, crisp, juicy; a fine culinary or dessert apple; a strong grower; bears little at first.

Nickajack, W.—Large, handsome, cooking or dessert apple; tree a strong grower and somewhat light bearer at first.

Dunn's Seedling, W. (syn. Munroe's Favourite).—One of the best all-purposes apples. Tree hardy and prolific. Excellent keeping apple; one of the best for cooking.

Northern Spy (New York), W.—Tree a rapid, upright grower, requires good soil, blooms late, productive, but not an early bearer. Young shoots, dark reddish brown; fruit large, yellowish green, with yellow-red cheek in the sun, and thin white bloom. Flesh white, tender, fragrant, juicy, crisp, brisk sub-acid, keeps well. It is also well known as a blight-resistant stock.

Rokewood (Bullock's Seedling), W.—A first-class Australian dessert apple of good keeping and carrying quality, and an abundant bearer. Sizes uneven when the tree gets old, requiring sorting. Fruit roundish, oblate, skin deep orange, heavily shaded with crimson, and dotted with brown russet. Eye somewhat open, tube conical and short, stamens medium, core ovate, axile, and solid. Flesh yellowish, firm, sugary, and juicy. Stalk short, set in a conical basin lined with russet.

Springdale, W.—An apple of recent origin, and a fine late keeper of large size. Colour, bright red. Tree hardy, good grower, and blight-proof, dark-green foliage, said to be a regular and heavy bearer.

Newtown Pippin (New York), W.—Ripens late in the winter. Fruit medium size, roundish, little irregular, caused by two or three obscure ribs on the sides. Skin dull green, changing to olive green, brownish on the sunny side, dotted with small grey specks. Flesh greenish-white, very juicy, crisp, with delicious aromatic flavour. It commands a high price in Covent Garden market, London. When in perfection stands unrivalled in all the qualities which constitute a high-flavoured dessert apple, to which it combines the quality of long keeping without the least shrivelling, retaining its high flavour to the last. The tree, like the yellow Newtown pippin, is of rather slender and slow growth, and even while young is remarkable for its rough bark. Should be tried with caution first, to ascertain whether it suits the locality. Requires a fertile, strong, deep, warm soil to attain its full perfection, and should be well manured every two or three years.

Rymer (English), W.—Tree vigorous, productive. Fruit ripens late; large and beautiful deep red, covered with yellowish grey dots on sunny side, faint streaks of pale red with reddish-brown dots on shaded side, roundish and flattened with five obscure ribs on the sides; eye closed; stalk short, in a round deep cavity lined with rough russet. Flesh yellowish, tender, and sub-acid.

Strawberry Pippin, W.—Large late apple, a good keeper; white flesh, tender, juicy, sub-acid; colour, yellow, splashed with red.

Shockley, W.—Medium size, somewhat conical; pale yellow overspread with red and small dots; late, good keeper; tree early and regular bearer, productive.

Stone Pippin, W.—Does well, especially on marly ground of the S.W. districts. Fruit medium size, roundish, pale, waxy, yellow when ripe, and dotted with white specks; flesh firm, crisp. A long keeper and very good culinary or dessert variety. Tree strong, upright, and very good bearer.

Sturmer Pippin, W.—An English dessert apple, ripens in winter. Tree hardy and an excellent bearer, and attains about the middle size. Fruit medium size, roundish, somewhat flattened. Skin yellowish-green, with tinge of dull red on side next the sun, and almost entirely covered with brown russet. Flesh yellow, firm, crisp, very juicy, with a brisk and rich sugary flavour.

Pears *(Pyrus communis)*.

In giving a description of the choicest pears to grow, either for home use or for market, the well-known Bartlett (Williams' Bon Chretien) will be considered as the typical summer pear, and the early varieties will be those which ripen before that fruit, whilst the late ones will comprise those ripening some time after. The indifferent bearing of a great many pear trees may be attributed to blights and to defective pollination of the flowers. Recent experiments are throwing a good deal of light upon this question, and by mixing varieties and planting in adjacent rows sorts which bloom approximately at the same time, a considerable improvement has been noticed in the bearing of some pears. Pear trees should be worked on seedling pears, as suckers are troublesome. Quince stock is not always suitable. Early pears are best when gathered before they part readily from the trees and laid up for a few days. For the later kinds the season may be prolonged. Every care should be taken not to store any bird-pecked or bruised fruit; and at all times they should be delicately handled and kept in a cool, dark place.

Citron des Carmes, E.S.—The best of the earliest sorts, ripening end of November and early in December. Fruit small, obovate; skin smooth and thin, bright green, changing to yellowish green with a faint tinge of brownish red, strewed with grey dots. Flesh pale, yellowish white, delicate, very juicy, melting; sometimes cracks on the surface. Tree a hardy and abundant bearer. Does also well on quince stock.

Souvenir du Congres, S.—One of the best early varieties, very large, but somewhat subject to smut; skin smooth, bright red when fully ripe. Short lived on quince stock. Flesh much like the Bartlett, having the musky flavour, though in a less degree.

Clapp's Favourite, S.—Tree upright, spreading, vigorous grower and heavy bearer. Fruit evenly distributed, and almost uniform in size; ripens just before the Bartlett. Fruit, medium size, obovate, slightly obtuse pyriform, surface uneven; skin thin,

pale lemon yellow, faintly splashed with crimson and fawn when exposed to the sun, sprinkled with dots and russet patches. Flesh white, melting, sweet, a little perfumed.

Bartlett, S. (syn. Williams' Bon Chretien).—An English pear and the most popular of all the summer varieties. Tree grows upright, with thrifty, yellowish-brown shoots, and narrow, folded leaves; early bearer and healthy, not much affected by the *fusicladium*; bears freely on the quince stock. Fruit large, obtuse pyriform, irregular and bossed in its outline, smooth, clear yellow, sometimes with delicate blush; stalk an inch long, stout, and inserted in shallow cavity, calyx open; flesh white, fine grained, juicy, melting, highly perfumed (musky), vinous flavour. It should be gathered before it becomes yellow, otherwise it speedily decays. Some pears blossoming approximately with the Bartlett should be planted with these trees to supply pollen to set the Bartlett crop. Amongst those are Clapp's Favourite, Howell, Duchesse d'Angoulême, Le Lectier.

Howell, S.—Follows Bartlett. Tree upright and a free grower; an early and profuse bearer; fruit large, waxen yellow, sprinkled with russet dots and patches; flesh whitish, juicy, melting; a very good market pear.

Le Lectier, S.—An excellent French pear, the result of a cross between Bartlett and Bergamotte Fortune. Tall, erect, vigorous, regular bearer; flesh fine, juicy, without granulations; highly perfumed.

Kieffer's Hybrid (American), A.—Raised from seed of the Chinese Sand Pear, accidentally crossed with Bartlett or some other kind. Fruit medium to large; oval pyriform; rich golden yellow, sprinkled thickly with small dots, often tinged with red on the sunny side. Flesh slightly coarse, juicy, melting, with a pronounced quince flavour. Good for canning only. If intended for eating, let hang on the tree until fully ripe, and keep a few days in a cool dark room and its quality will be fully developed. However mature a Kieffer pear may be, it is never good when first picked from the tree. Keeps and packs well, and for that reason suitable for export. A vigorous as well as an early bearer. If allowed to become overloaded or starved, the tree produces small, hard fruit of poor flavour.

Le Conte, A.—A variety of the Chinese Sand, like Kieffer's Hybrid, vigorous grower with luxuriant and distinct foliage, large bell-shaped fruit. Should be treated as the Kieffer pear.

Fertility, A.—Ripens at the same time as Louise Bonne de Jersey. Fruit large, well coloured, and of high flavour. Tree vigorous and healthy grower; a good and regular bearer.

Louise Bonne de Jersey (France), A.—Ripens in the autumn. Succeeds admirably on the quince, producing then a delicious pear. Tree vigorous, upright, very productive. A profitable market pear where it succeeds, healthy. Fruit large oblong

pyriform, a little one-sided; glossy, pale-green in shade, brownish-red in sun, numerous grey dots; stalk curved, rather obliquely inserted, without depression, or with a fleshy, enlarged base; calyx open in a shallow, uneven basis; flesh very juicy and melting, rich and excellent; very prolific.

GANSEL'S BERGAMOTTE, A.—A dessert pear of the highest quality. Tree rather shy bearer for the first few years, then productive, moderately vigorous, and spreading in habit. Young wood, dull greyish-brown. Fruit medium to large roundish obovate, but much flattened. Skin roughish brown, becoming yellowish-brown at maturity, tinged sometimes with a russet red cheek and sprinkled with spots of russet. Stalk short, fleshy at both ends. Cavity moderate. Calyx short and small, placed in a smooth moderate hollow. Flesh white, melting, very juicy, rich sweet, and aromatic.

BEURRE DE CAPIAUMONT, A.—Fruit medium size, pyriform. Skin pale yellow in the shade, almost entirely covered with cinnamon-coloured russet, strewed with grey specks, and with reddish orange shining out through the russet on the sunny side. Flesh white, delicate, fine, melting, with a rich, juicy, sugary flavour. A fine dessert pear. Tree hardy, vigorous, and a good bearer.

BROOMPARK, W.—Fruit medium, obovate. Skin sprinkled with cinnamon-coloured russet. Flesh yellowish, melting, with a musky flavour. Tree vigorous and excellent bearer; succeeds well either on the pear or the quince stock. Does well on heavy loam.

BEURRE CLAIRGEAU, W.—Ripens in winter. The size, early bearing, productiveness, and beauty of this pear render it a profitable market sort. In some cases it seems disposed to shed its leaves prematurely—a serious defect. On young trees the fruits are often large and drop off easily; age remedies this defect. Tree very vigorous, forming a beautiful pyramid. Young wood reddish brown. Fruit large, curved, pyriform, with unequal sides; yellow, shaded with orange and crimson, thickly covered with russet, sometimes sprinkled with russet; stalk short, stout, and fleshy, inserted by a lip at an inclination almost without depression; when lip is absent, the cavity is uneven; calyx open; flesh yellowish, buttery, juicy, granular, sugary, perfumed, vinous, coarse unless properly ripened. A popular variety for local and distant markets. Not much subject to *fusicladium*. Suitable for export.

VICAR OF WINKFIELD, W. (syn. Napoleon).—A large, fair, and handsome French variety, also a first-rate baking pear, but sometimes too astringent; second-rate for a table pear. Tree grows thriftily, with drooping fruit branches, shoots diverging, dark olive brown, very productive, hardy; fine size fruit and a profitable market cooking pear. Fruit large and long pyriform; often one-sided, pale yellow, fair and smooth, sometimes with brownish cheek, and marked with small brown dots; stalk slender, obliquely inserted without depression; calyx large, open, set in a basin very slightly sunk; flesh greenish-yellow, juicy, with good sprightly flavour.

not much touched by *fusicladium* nor by the pear mite. Suitable for export and stewing.

JOSEPHINE DE MALINES, W.—One of the best winter varieties. Tree a moderate grower, somewhat straggling, hardy, foliage small, quite productive. Should be planted on rich soil or grafted on a strong growing sort. Young wood olive-yellow-brown, very short jointed. Buds round, projecting. Fruit medium, roundish, flattened; pale yellow or straw colour at maturity, sometimes nettled and patched with russet; flesh white, tinted with rose, juicy, melting, sweet, slight aroma. Ripens midwinter, and often keeps till spring. Suitable for export.

WINTER NELIS (syn. Bonne de Malines), W.—Reported liable to *fusicladium*, and an irregular bearer in the coast region of California; in other localities a hardy and thrifty tree, rather slender and a poor, crooked grower, better grafted on a strong growing variety, an early and regular abundant bearer; the crop usually needs thinning, especially on trees of considerable age; fruit is always inferior when the tree is overloaded, but this applies to nearly all varieties, though not in the same degree. Fruit medium, roundish, obovate, narrowed near the stalk; yellowish-green, dotted with gray russet and a good deal covered with russet; stalk rather long, twisted, and set in a narrow cavity; calyx open in shallow basin. Flesh yellowish white, fine-grained, buttery, very melting, and full of rich, sweet, aromatic juice. Suitable for export.

L'INCONNUE (Belgium), W.—A very excellent winter pear. Tree hardy, vigorous, upright, very productive. Fruit medium or below, broad oval pyriform, light yellow, nettled and patched with russet and many russet dots; stalk long, curved, inclined and set in a slight depression, sometimes by a lip. Calyx open. Segments long and curved. Basin shallow, uneven. Flesh yellowish-white, juicy, crisp, very sweet, rich and pleasant. Packs and carries well.

QUINCES (*Pyrus Cydonia*).

ANGERS, A.—This is the variety most generally used for stocks on which to bud the pear. Fruit large, yellow, keeps well. A strong growing sort, and abundant bearer.

APPLE OR ORANGE, A.—A popular variety, large, roundish fruit, bright yellow. Ripens early, stews quite tender; excellent flavour. Bears most abundant crops; leaves oval.

CHAMPION, A.—Fruit very large, smooth; tree very productive, bearing abundantly when young; flesh cooks tender and without hard spots or cores.

BOURGEAUT, W.—A vigorous French variety of good quality, keeps well, cooks tender. Fruit very large, golden colour, smooth velvety skin and resistant to the leaf blight.

VAN DIEMAN, W.—Seedling of "Portugal," but much more prolific and an early bearer. Fruit large and of excellent quality. One of the best.

THE INSECT PESTS AMENDMENT ACT, 1898.

The following amended Regulations were published in the *Government Gazette* of the 1st of August:—

ORDER IN COUNCIL.

At the Executive Council Chamber, at Perth, this 23rd day of July, 1902.

Present:
His Excellency the Governor.
The Honourables—

The Attorney General,	The Minister for Lands,
The Colonial Secretary,	The Minister for Works and Railways,
The Minister for Mines,	The Colonial Treasurer.

WHEREAS by "The Insect Pests Amendment Act, 1898," the Governor, by Order in Council gazetted, may from time to time make such Regulations as he deems necessary for the purposes mentioned in Section 24 of the said Act: AND WHEREAS I, the Hon. Sir ARTHUR LAWLEY, K.C.M.G., Governor, etc., etc., etc., deem it necessary that all Regulations heretofore made under this Act should be revoked, and other Regulations made in lieu thereof for the purposes of the said Act: NOW THEREFORE I, the said Governor, by and with the advice and consent of the Executive Council, do hereby order and proclaim that the Regulations made on the 5th day of July, 1901, under an Order in Council gazetted on the 6th day of July, 1901, and all other Regulations made under the said Act, be revoked, and I do hereby, in lieu thereof, make the following Regulations for the purposes of the said Act.

ARTHUR H. WILLIAMS,
Clerk of the Council.

REGULATIONS.

IMPORTATION AND DISINFECTION OF VINE CUTTINGS BUDS AND GRAPES.

1. The importation of rooted grape vines or grape vines that have had their roots removed is absolutely prohibited.

2. All vine cuttings imported shall be absolutely surrendered to the Chief Inspector or Local Inspector at the port of debarkation for the purpose of being quarantined as hereinafter provided.

3. All vine cuttings imported shall be quarantined by the Department of Agriculture for a period of not less than 12 months nor longer than two years upon such grounds as from time to time shall be set apart by the said Department by advertising in the *Government Gazette* as quarantine stations. The consignee agent or other person engaged or concerned in the importation of any such vine cuttings as aforesaid shall at the time of delivering the

same to the Department of Agriculture for the purpose of being quarantined pay to the Director of Agriculture a sum of 2s. 6d. for every 100 cuttings so delivered and at the expiration of the period of quarantine shall upon taking delivery of his rooted vines pay the further sum of 2s. 6d. for every 100 rooted vines so delivered to him.

4. Any vine cuttings imported which are at the time of landing in the opinion of the Chief Inspector or Local Inspector affected with insects fungi blight or other diseases injurious to grape vines or other trees or plants shall be destroyed under the direction of the said Inspector and the expense connected therewith shall be borne by and recoverable from the importer of such vine cuttings.

5. The Department of Agriculture shall not be liable for any loss resulting from the destruction of any cuttings under the provisions of the preceding paragraphs or by reason of the infertility of any such cuttings while in or after leaving their custody or whilst under their control.

Schedule.

Scale of Fees to be paid for the Inspection and Disinfection of Vine Cuttings and Buds.

	s.	d.
100 or less	2	6
Over 100 and not more than 500	5	0
Over 500 and not more than 1,000	10	0
Over 1,000, for every additional 1,000 or part thereof ...	2	6

Disinfection of Imported Trees Plants Cuttings (other than Vines) Grafts Buds Seeds Pits Scions and Fruits.

6. All fruit fruit trees plants cuttings grafts buds seeds pits or scions imported into the State of Western Australia shall be discharged direct from ship or lighter into trucks or as may be ordered by the Director of Agriculture for immediate removal to the disinfecting sheds and shall not be discharged upon any wharf quay jetty or premises unless so ordered by the Director of Agriculture.

7. All consignees agents or other persons engaged or concerned in the importation into Western Australia of any fruit fruit trees plants cuttings buds (other than vine cuttings or buds) seeds pits or scions shall within twenty-four (24) hours after the arrival of any such fruit fruit trees plants cuttings buds seeds pits or scions at the first port or place of debarkation in the State of Western Australia deliver the same to the said Chief Inspector or Local Inspector and unpack and prepare them for disinfection and in the event of any such consignee or his agent failing to so deliver any such fruit fruit trees plants cuttings buds seeds pits or scions within twenty-four (24) hours as aforesaid the Chief Inspector or Local Inspector shall seize the same. If upon such seizure the said fruit fruit trees plants cuttings buds seeds pits or scions are found to be infested with any injurious insects (or their germs) or with fungi blight or other diseases injurious to fruit or to vines or fruit trees or to other trees or plants the said Inspector shall immediately destroy the same but if the said

fruit fruit trees plants cuttings buds seeds pits or scions are found on inspection to be free from injurious insects (or their germs) or from fungi blight or other diseases injurious to fruit fruit trees vines or other trees or plants the said Inspector shall treat the said fruit fruit trees plants cuttings buds seeds pits or scions as may be prescribed by the Director of Agriculture and hold same until applied for by the consignee or agent. Provided that if the same be not applied for within forty-eight (48) hours from time of seizure the same may be destroyed.

8. All fruit fruit trees plants cuttings grafts buds seeds pits or scions imported into the State of Western Australia are hereby required to be disinfected by the Chief Inspector or Local Inspector immediately upon arrival at the port or place where they are to be unloaded. If any of the said fruit fruit trees plants cuttings grafts buds seeds pits or scions are found to be infested with insects (or their germs) or with fungi blight or other diseases injurious to fruit or to fruit trees or to other trees or plants they shall remain in quarantine for a period of fourteen (14) days or until the Chief Inspector or Local Inspector can determine whether the said trees plants cuttings grafts buds seeds pits or scions are free from injurious insect pests or their eggs larvæ or pupæ. After inspection and disinfection the Chief Inspector or Local Inspector shall issue a certificate after the cases or packing or transportable material in which such fruit was packed has been disinfected as prescribed by Order 11 and on receipt of the fee for inspection and disinfection prescribed in Schedules I. II. and III. hereto. After disinfection consignees or their agents must repack the fruit fruit trees vine cuttings packages or transportable material that have been disinfected and remove the same within twenty-four (24) hours.

9. All peach nectarine apricot plum prune almond and all trees budded or grafted upon peach stocks or roots and all peach or other pits cuttings buds or scions raised or grown in any place where the "peach yellows" or the "peach rosette" are known to exist are hereby prohibited from being imported into the State of Western Australia.

10. The importation into any port in Western Australia of any fruit plant or part thereof infested with the codlin moth mussel scale Queensland fruit fly phoma citricarpa phylloxera the San José or pernicious scale the mining or chionaspis scale the wax scale or with internal parasites such as the larvæ of the codlin moth fruit flies nematodes or bacterial diseases with melanose fungus or with any pests parasites or fungi which may from time to time be declared as such by the Governor in Council under Section III. of "The Insect Pests Amendment Act 1898" is absolutely prohibited.

11. Soil or compost in pots cases or packages and transportable material of any kind used for packing or surrounding fruit is hereby prohibited from being removed from the first port or place of debarkation or from being offered for sale gift distribution or transportation until the said material (unless otherwise directed by

the Director of Agriculture) has been disinfected by dipping the same and keeping it continually submerged for a period of not less than five (5) minutes in boiling water containing in solution not less than one pound (1lb.) of concentrated potash to each and every ten (10) gallons of water.

12. Fruit cases containing vegetables or vegetable matter other than fruit imported into the State are also hereby required to be disinfected as per Order 11 before removal from the first port or place of debarkation.

13. Any fruit fruit trees vine cuttings packages or transportable material delivered to the Chief Inspector or Local Inspector for disinfection and not disinfected within forty-eight (48) hours by reason of the default of the consignee to provide the necessary labour for unpacking and repacking may be destroyed by the Chief Inspector or Local Inspector.

Schedule I.

Scale of Fees to be charged for Inspection of Fruit.

	s.	d.
56lbs. or under	2.	6
Over 56lbs. and not more than 112lbs.	5	0
Over 112lbs. and not more than 224lbs.	7	6
Over 224lbs. and not more than 336lbs.	10	0
Over 336lbs. for every additional 112lbs. or part thereof	1	0

Schedule II.

Scale of Fees to be paid for the Inspection of Trees Plants etc. of all Descriptions other than Vine Cuttings.

	s.	d.
25 or less	1	6
Over 25 and not more than 50	2	6
Over 50 and not more than 100...	4	6
Over 100 and not more than 200	6	6
Over 200 and not more than 300	7	9
Over 300 and not more than 400	9	0
Over 400 and not more than 500	10	0
Over 500 for every additional 100 or part thereof ...	0	9

Schedule III.

Scale of Fees to be charged for the Inspection and Disinfection of Gooseberries Raspberries Strawberries Bulbs not in earth and other small plants of a like nature at the discretion of the Director of Agriculture.

	s.	d.
25 or less	0	9
Over 25 and not more than 50	1	3
Over 50 and not more than 100...	2	3
Over 100 and not more than 200	3	3
Over 200 and not more than 300	4	0
Over 300 and not more than 400	4	6
Over 400 and not more than 500	5	0
Over 500 for every additional 100 or part thereof ...	0	6

Registration of Orchards Vineyards and Nurseries.

16. The owner or occupier or person in charge of any orchard garden nursery vinery vineyard or hot-house or any land used for the purpose of growing or cultivating any plants shall register the same with the Director of Agriculture at Perth in the form of the accompanying schedule and at the same time forward for registration fee the sum of 2s. 6d. for an area of one acre or under and the sum of 5s. for an area exceeding one acre.

Schedule.

Insect Pests Amendment Act, 1898.

Magisterial District....................Collector's District......................
(By Collector's District is meant the police patrol district). Names of owner and occupier and person in charge..................................Name of holding for which this return is supplied...
Postal address............................

I hereby certify that to the best of my belief and knowledge the above particulars are correct.

Signed...

Fee of (   ) herewith.

15. All packages sent away from any nursery containing fruit trees vines or other vegetation intended for sale distribution or gift must be legibly marked with the name and address of the consignor and consignee and a descriptive invoice of the contents must accompany same together with a certificate to the effect that such contents have been disinfected as may be prescribed from time to time by the Director of Agriculture and are free from insects fungi blight and all other diseases attacking fruit fruit trees and other vegetation.

16. Any vendor of fruit grower dealer or auctioneer who shall sell or attempt to sell or offer or expose for sale any fruit fruit trees plants or other vegetation affected with the codlin moth mussel scale Queensland fruit fly the phoma citricarpa phylloxera the San José or pernicious scale the mining or chionaspis scale the wax scale or with internal parasites such as the larvæ of the codlin moth fruit flies or nematodes or bacterial diseases or melanose fungus or with any other diseases which may from time to time be declared as such by the Governor in Council shall be liable on conviction to a penalty not exceeding One hundred pounds (£100) and any Inspector or other authorised person shall seize and destroy such infected fruit and the cost of such seizure and destruction shall be at the expense of and recoverable from the person selling or offering the said fruit for sale gift or distribution.

17. No compensation will be paid for any fruit fruit trees plants cuttings buds seeds pits scions cases packages or transportable material destroyed under these regulations.

18. The use within the State of second-hand fruit cases or cases or packages that may reasonably be supposed to have contained fruit is prohibited and the Chief Inspector or Local Inspector

may order the disinfection of same as provided in Order 11 or by any other means that may be prescribed by the Director of the Department of Agriculture and failing such disinfection shall seize and destroy same.

19. The foregoing orders do not apply to any port or part of the State of Western Australia North of the 26th parallel of South latitude.

20. The importation into the State of Western Australia South of the 26th parallel of South latitude of fruit fruit trees plants cuttings grafts buds seeds pits or scions is prohibited except through the ports of Albany Fremantle Geraldton and Esperance.

21. These Regulations shall come into force on the 1st day of August, 1902, and supersede those gazetted 6th July, 1901.

ARTHUR H. WILLIAMS,
Clerk of the Council.

BEE NOTES.

By J. Sutton.

SEASONABLE HINTS ON SWARMING.

Providing that the bees have had plenty of stores, and have been kept dry and snug, they should now be showing an inclination to swarm. Now is the time to keep an ever-watchful eye on your best stocks. If it is desirable to increase your stocks, the best way is to obtain a good queen cell, and place this, together with a frame of brood and another of stores, or honey, in a separate hive. Five fairly good colonies may be made from one strong hive, and thus to a great extent prevent swarming.

As some, however, may prefer natural swarming, it is always best to clip one of the queen's wings. This done, you can wait the pleasure of the bees, and when the swarm issues the apiarist should be on hand to secure the queen, which will be found near the entrance, or hopping about, in a vain attempt to fly and join the swarm. When found, carefully pick her up and place in a cage—the Miller cage, as illustrated, is a good and handy one for this purpose.

Having secured the queen, place her in some quiet, shady place, ready when she is wanted. This done, remove the old hive, with what bees are left in it, and put in its place a New Hive, with frames of brood or full sheets of foundation; get the caged queen and push it into the entrance of the new hive, and you will soon find the swarm returning and entering their new home; let them

get nicely settled, then go to some other colony and take from it a frame of open brood (cells having brood in all stages, but not capped). Be careful you do not take any bees; shake them all off the frame in front of their hive; place this frame in the centre of the new hive, close up; now open the cage and let your queen run in, and your work is done, so far as the swarm is concerned.

Miller's Queen-catcher and Introducing-cage.

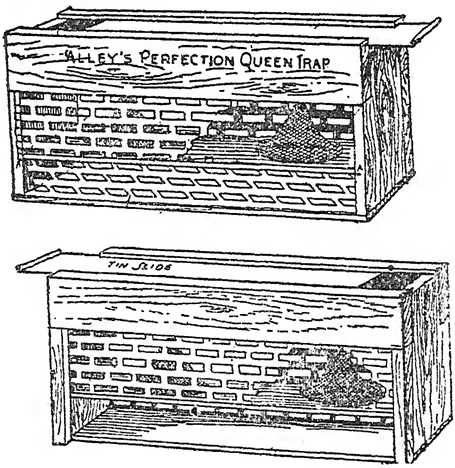
Now, to return to the old hive. Here three questions arise. If you want to increase your colonies, is the first. Next, you may not want to increase; and thirdly, you don't want to increase, but desire to replace the old queen with one of her daughters. We will deal with each case separately.

First.—Increase—Open up the old hive, carefully examine each frame, and find out how many queen cells there are. Now, having done this, decide how many nuclei you will fix up. Cells may be found on several frames, or they may all be on a single frame, any number up to 20. At that, well, say you decide to make five nuclei, then pick the five best cells—and if on separate frames all the better—place one in each, another frame with brood, and yet another with honey, three in all. In this case you may remove them and place on any stand, and the bees, in most cases, would stop quite contented; but it is preferable to secure them as above, for a day or two. Having made up your five nuclei, cut out all the cells you do not want, and in case all the cells are on a single frame, you will need to cut out those you require in each nuclei. Be careful and cut them out with a sharp knife, place between two frames, and the bees will fix them up. After you have closed the frames together, just to hold them in position, now leave those until the young queen hatches out and gets fertilised. As soon as she has laid eggs in one or two frames, catch her and cut one of her longest wings. If you have other colonies and want to build up these nuclei quickly, take from any colony one frame of hatching brood, and give to each of the nuclei, being careful not to take along with it any bees. This will considerably strengthen and help to build up the same.

Second.—Where increase is not desired as above, carefully examine each frame in the old hive, and destroy all queen cells, then leave them until next day, or longer, only if left longer the frames will require to be gone over again for fear of new cells having been started; these should be removed, when good brood frames may, after shaking all bees out of them, be placed in the brood nest, and empty frames taken out and placed in their places. This done, the old hive can be placed on top of the new hive as a super.

THIRD.—Where increase is not required, but it is desirable to replace the old queen with one of her daughters, in this case remove all queen cells from the old hive, except one, the LARGEST; place the hive on a new stand, that the young queen may hatch out and become fertilised; and so soon as she begins to lay and has a few frames with open brood, ready to make a good strong colony, go to the new hive, find the old queen and remove her; then, having disposed of the old queen, remove the new hive, and place the old one, in which you have the young laying queen, on its old stand. Place a honey board on top, when the new hive can be added as a super. [Note.—If desired to have the wing of the queen clipped, this should be done before building up.] Thus, you will have made a good strong colony, with a young queen, which will be ready to take full advantage of a honey flow, should such be available, and not any further trouble as regards swarming.

NOTE.—When building up for increase, be careful not to give more frames than there are bees to cover them. Better to crowd them a little than to give too much room; and if you want a few good worker frames, give starters, keep them a little crowded, and your object is gained. Where honey is preferred to increase, see your colonies are strong; five strong colonies will store more honey than a dozen weak ones will do in the same time.



Alley's Queen and Drone Trap.

Should it be the desire of the apiarist to prevent swarming, the only safe plan is to closely examine each hive every nine (9) days, and cut out all queen cells. In cases where attention cannot be given during the swarming season, it is always best to use the Alley's Queen Trap (as illustrated). With those the swarm can come out, but the queen is secure, and can be treated as described above.

INSECT PESTS ACT.

MONTHLY REPORT.

The work of inspecting orchards has been proceeded with vigorously during the past month, over eighty orchards being closely examined for the purpose of ascertaining in how many the San José scale exists, with the result that twenty-seven were found to be infested. Of these, five are now reported for the first time, while in the others the scale was known to exist formerly.

In the orchards which were fumigated last season for this disease there is generally a satisfactory diminution of its attacks. The inspectors, in nearly every instance where this treatment was carried out last season, report that the pest is only very slightly affecting the trees, and in some instances orchardists are lulled into a false feeling of security on account of this disease not appearing to execute the damage which it is claimed it will do. It should, however, be clearly understood that fruit-growers are required to absolutely extirpate this pest from their trees, and it may not be out of place to quote that under the regulations of the Insect Pests Act, 1898, the person who shall sell, or attempt to sell, fruit affected with the San José scale is liable to a penalty of £100. Every assistance is given to fruit-growers to enable them to deal with this pest, and it is only fair to expect in return that they will not relax their efforts to cope with it; but will maintain a diligent battle with it until it is finally exterminated. The fruit-growers of West Australia are exceedingly fortunate in their complete immunity from certain serious fruit pests, and they should not grudge a little labour and money to reduce the list by one more. Most of our local landholders and fruit-growers are perfectly unanimous in regard to keeping out the rabbit and the codlin moth, but when the question of dealing with stinkwort, San José scale, and other noxious weeds and pests which they have on their own holdings is brought up, a totally different spirit seems to animate, or rather inanimate, them. In dealing with the San José scale, some growers prefer to attempt its eradication with the spray pump rather than adopt the fumigation treatment, which is, no doubt, more costly and laborious, but is certainly much more effective and thorough if properly carried out. As an instance of the failure of the spraying treatment may be mentioned an orchard in which two trees were originally found to be infested. This number has increased until there are now over a hundred trees affected in the orchard, in spite of the fact that the trees have been thoroughly sprayed. The inspector who examined this place recently, in referring to the spread of the scale says, "I found 21 trees slightly infested in a block at least half a mile from those found last season, and 12 trees near those which were treated last season. The remainder are those which, last season, had a rather bad attack, and had to be sprayed a number of times. Most of them are this season showing live scale, but not in very large numbers." There is every reason to believe that the failure of the spray pumps to dislodge the scale in

this case was in no way due to want of thoroughness on the part of the operator, and while this method of treatment may prevent the scale from doing serious damage to the trees, it cannot prevent the disease from spreading from tree to tree, and consequently from one orchard to another. Another scale insect which has claimed considerable attention at the hands of the inspector in Perth is the large brown vine scale (*Lecamum Cymbiforme*), which was first found infesting vines and fruit trees in the gardens in the city about twelve months ago. An examination of all gardens in which this pest was found last season has been made, with the result that numerous young scale insects were found in many of the gardens. The occupiers of premises where this scale has been located have been required to carefully destroy all prunings by burning, and to thoroughly cleanse the affected vines and trees. In many cases this work has been most satisfactorily carried out, but there still remains a few places to be dealt with, and the proper performance of the work will be insisted on.

It is feared that should this pest obtain a proper hold it would become a serious menace to the vine grower; therefore it is hoped that vignerons, and anyone who may have vines growing, will be on the alert for the appearance of this new vine pest. Should any orchardist become aware of its presence on his vines or trees, he should not be satisfied with eradicating it from his own premises, but should immediately report its occurrence to this department, so that an inspector may be sent to the locality to examine all other places in the neighbourhood, and if found, to take measures to stamp it out. In failing to report its presence, orchardists take the surest possible means of maintaining the permanence of disease in their locality.

The importations of fruit from the Eastern States continues to be steadily maintained, a total of 8,594 cases being received at the various ports during the past month. Apples comprise the bulk of the fruit now arriving—no less than 5,659 cases passing through the ports during July. The condition of the fruit in regard to disease continues to be fairly satisfactory, though there is apparently a tendency on the part of shippers to see how far they can safely go in shipping apples with such diseases as Black Spot and Mussell Scale. Some cases came to hand recently so badly affected with the former disease that no effort was made to separate the clean from the diseased fruit, the whole case being dumped into the furnace.

The importations of fruit trees is now practically over for this season, though stocks of citrus fruits may continue to come to hand during the present month. The total number of fruit trees passed through the ports during the past three months amounts to 98,326, which, if planted at about the ordinary distance, would add an area of over 1,000 acres to that already planted under fruit trees. Apparently apples still continue to be planted largely, as no less than 41,825 apple stocks were imported during the period referred to. These trees when planted should add another 500 acres to the area at present under apple culture.

The local fruit passing through the auction rooms and offered for sale in the shops in the city is of a much cleaner character than of former seasons. Now that more fruit is to hand and competition keener, growers find that anything less than clean fruit will not realise top prices.

G. BUCHANAN,
Chief Inspector.

THE FRUIT INDUSTRY.

TRADE WITH THE WEST.

The following, from the *South Australian Advertiser*, is interesting on account of Mr. Bishop having formerly expressed the opinion in a letter which was published in the local press that, owing to the severe inspection of fruit entering West Australia, it would be impossible to ship any to that State. It is gratifying to know that a closer examination of the methods adopted at Fremantle shows that while the interests of the local fruit-growing industry are amply protected by the inspection, no unnecessary hardship or loss is inflicted on the shippers or importers of fruit. The wisdom of permitting only clean fruit to be passed has been clearly shown by the improved quality of the stuff now coming to hand :—

"The exportation of fruit to West Australia during the last few years has resulted in great benefit to growers of this State. There is a splendid market there for fruit of first-class sample. Mr. J. J. Bishop, who is a large orchardist residing at Norton's Summit, and has been connected with the West Australian trade for five years, has just returned from a month's visit to that State, where he has been inquiring into the working of the fruit inspectors' department there.

"On Thursday afternoon Mr. Bishop told a representative of the *Advertiser* that he exported 2,000 cases of cherries to the West last year, and as other exporters had also sent large consignments, the cherry market here was greatly relieved, and good prices were consequently maintained. There are hundreds of acres of young cherry trees under cultivation in the hills, which will come into bearing in the course of a few years. They grow hardly any cherries in the West, and have to depend almost entirely on this State for their supplies, so that practically the whole of the West Australian market is open for the South Australian grown fruit.

"Mr. Bishop also sent away about 3,000 cases of plums, a large quantity of apples and pears, and other produce last season. He found that the fruit was taken direct from the ship's side by rail to the inspection sheds, which was built upon very up-to-date principles. They have fumigating rooms for treating citrus fruit, which is put into a close room to destroy all scale pests. The cases, after being emptied of their fruit, are put into a steaming room, where all cases

are brought to boiling heat by steam. There is also a steam hose applied to the trucks on which the fruit has been carried. The cases of apples from this State are opened and the fruit emptied on to tables by the owners or agents. It is then carefully examined by the inspectors, and if found free from insect pests, it is passed through without trouble. But if the fruit show traces of the codlin moth each apple is examined very carefully, and those that look suspicious are cut open. If the living grub is found the contents of the case are destroyed by fire, but no fruit is condemned unless it is found to be infested with the living grub. The inspection is nothing more than is necessary to protect the State from pests, and fruit exporters here can depend on fair treatment from the chief inspector (Mr. Beatty) if they are careful to ship nothing but first-class and clean fruit.

"Mr. Beatty informed Mr. Bishop that the Queensland fruit fly was recently found in a consignment of mandarins from Sydney. They were condemned and destroyed, and he pointed out that no trouble they could possibly take would be too great if they could succeed in keeping out this fruit fly. He considered it the worst pest known, and that the codlin moth bore no comparison to it. Through the courtesy of the Agricultural Bureau, Mr. Bishop obtained some specimens of the Mediterranean fruit fly (*Haltero-phora capitata*), which is said to be little different from the Queensland fly, and which has got a firm hold of West Australia. It attacks nearly all kinds of fruit, and reduces it in a short time to a putrid pulp. Its habits are such that, with the exception of gathering and destroying affected fruit, nothing can be done in the West to keep it in check. As mandarins and bananas are imported into this State from Sydney, Mr. Bishop hopes the authorities recognise the importance of taking every precaution to keep this curse from being allowed to land here."

ANSWERS TO CORRESPONDENTS.

Mr. Jas. Jeffrey, Waterloo, writes:—I have got 300 grape vines three years old which I intend to graft on to this season, and I shall be very thankful if you will give me some information on the subject. The above are Cabrenet wine grape. 1. What sort should I work on them? I want a good table grape. 2. Should I cut the vine under the ground to work on, and should I put more than one graft on the stump? 3. Is it necessary to use grafting wax? 4. Would the grafting be better left till late in the season, or done at the present time?" The matter being referred to the Horticultural and Viticultural Expert, Mr. Despeissis replies:—"1. Purple Constantia, E., White Nice, Dorodillo Albilio, and Muscatels are all suitable for grafting on Cabernet stock. 2. Cut the vine to be grafted half an inch or so below the ground. If the stump is a slender one it will only carry one graft, if of a larger diameter two grafts; one on each side should be inserted. 3. Grafting wax and all such preparations are detrimental to successful vine grafting. Pack earth, pure and simple, around and over the graft. 4. Begin grafting towards the end of August or beginning of September, when the sap rises in the stock. The scion cuttings should be lightly buried away from light to keep them back."

MARKET REPORT.

FOR MONTH ENDING 31ST JULY, 1902.

The West Australian Farmers' Co-operative Company, Limited, City Markets, Perth, report as follows:—

Markets have been rather quiet past month, but now that farmers have completed ploughing and sowing, produce is being more freely placed upon the market.

Farm Poduce.—Chaff market fully supplied; prices have eased somewhat. Prime quality, £5 2s. 6d. to £5 7s. 6d. per ton; dry lines, £4 10s. to £4 15s. per ton; straw chaff, £3 10s. per ton; hay in bales, £4 5s. to £4 15s. per ton; straw in bales, £2 10s. to £3 per ton. Wheat.—Market weaker; truck lots, 5s. 3d. to 5s. 4d. per bushel; smaller quantities, 5s. 6d. to 5s. 8d. per bushel. Oats (New Zealand), 4s. 6d. to 4s. 7d. per bushel. Flour, £11 to £11 5s. per ton for local brands; imported flour, £12 to £12 10s. per ton. Potatoes.—Very few local offering; value £11 10s. to £12 10s. per ton; imported potatoes, £8 10s. to £9 10s. per ton; seed potatoes, £10 to £11 per ton. Onions, £10 10s. to £11 per ton.

Dairy Produce.—Local butter, 1s. 6d. to 1s. 10d. per lb.; New Zealand butter, 1s. 2½d. to 1s. 5½d. per lb. Hams, 1s. to 1s. 3d. per lb. Local bacon, 11d. to 11½d. per lb. Cheese, 9½d. to 10d. per lb. Honey, 60lb. tins, 15s. each. Eggs: supplies increasing considerably, prices have gradually receded from 2s. to 1s. 8d. per doz.

Fruit.—Local apples about finished; 12s. to 18. per case. Imported apples, 9s. to 15s. per case. Local oranges, 5s. to 10s. per case; navels, to 15s. per case; mandarines, 12s. to 16s. per case. Lemons, 7s. to 8s. per case.

Vegetables.—Cabbage still plentiful; price 3s. to 6s. per cwt., according to quality and condition. Cauliflowers firmer; 6s. to 9s. per doz. Swedish turnips, £6 to £7 10s. per ton. Pumpkins, £7 10s. per ton. Bunch roots very scarce, especially carrots and parsnips, which are worth 2s. 9d. to 3s. per dozen bunches. Turnips, 1s. to 1s. 6d. per dozen bunches. Celery, 2s. 6d. to 3s. per dozen. Beet root, 2s. 6d. to 2s. 9d. per dozen bunches. Parsnips, 6d. to 9d. per dozen bunches. Salads, 7d. to 9d. per dozen bunches.

Poultry.—This line fluctuates considerably. Prime table fowls, 6s. to 6s. 3d. per pair; ordinary fowls, 5s. to 5s. 6d. per pair; chickens, 3s. 6d. to 5s. per pair. Ducks scarce, 9s. to 10s. per pair. Geese, 14s. to 15s. per pair. Turkey gobblers, 20s. to 22s. per pair. Turkey hens, 10s. to 12s. per pair. Pure-bred fowls, 10s. to 20s. per pair. Ducklings about a week old, 12s. per dozen.

Live Stock and Carcase Meat.—Pigs scarce. Prime porkers, to 38s. each; forward stores, 18s. to 30s. each; backward stores, 12s. 6d. to 15s. each.; suckers and weaners, 8s. to 10s. each. Sheep, 22s. to 32s. each. Prime carcase pork, 7d. to 7½d. per lb.; heavy-weight pork, 5d. to 6d. per lb. Vealers, 5d. to 6d. per lb. Beef, 5½d. to 6d. per lb. Mutton, 5½d to 5¾d. per lb. Spring lambs, 10s. each.

Sundries.—Bran sacks (new in bales), 4s. per dozen; smaller quantities, 4s. 3d. per dozen; second-hand bran sacks, 3s. per dozen. Corn sacks, 3s. 6d. per dozen. Bonedust, £7 to £7 10s. per ton.

The attention of producers is respectfully directed to the operations of this Company; being conducted purely upon co-operative principles, the profits are divided amongst the shareholders.

All producers may become shareholders on very easy terms. Full particulars from the Secretary.

GARDEN NOTES FOR SEPTEMBER.

By Percy G. Wicken.

The present month may be looked upon as the spring month of the year, when most of the seeds already germinated will make a rapid growth, and the seeds planted will begin to appear above the ground in a very short space of time.

Frosts may now be said to be a thing of the past, and many of the more tender plants may be planted in the open without risk. Plants that have been raised in pots or under glass may now be planted out in the open. This being the best month of the year for planting out all kinds of summer vegetables, the most should be made of the time so to enable the plants to obtain a root hold before the weather becomes hot. The land requires to be well worked up, and the surface as smooth and level as can be obtained; a liberal supply of well-rotted stable manure should be dug in and well mixed with the soil; this helps to keep the soil moist, as well as supplying the necessary food for the plants. If stable manure cannot be obtained, artificial manure must be used, but the application of a dressing of manure is necessary to produce good and quickly-grown vegetables.

Asparagus.—May still be planted in the cooler districts of the State, but in the warm localities the shoots will have already started into growth.

Artichokes.—May still be sown, and are worth growing for food for stock, as well as for table use.

Beans (French or Kidney).—All varieties of French or Runner Beans may be sown. The dwarf varieties are the easiest for growing, as they do not require staking, but the runner beans can be kept down by pinching back. Too many rows should not be sown at one time, but a row or two each week to keep up a succession.

Beet.—Both red and silver beet may be sown; the seed takes some time to germinate, and is better if soaked for some 12 hours before sowing. Plant in rows 18 to 24 inches apart.

Cabbage.—Sow a little seed in a seed bed, and shelter from the sun and keep the bed moist; when the plants begin to come up the covering must be removed or the plants will become weak and feeble. The St. John's Day is one of the best varieties for summer. Cabbage that are now well up should receive a top-dressing of sulphate of ammonia or nitrate of soda, applied, if possible, just before a shower of rain.

Cape Gooseberry.—Seeds may be sown in beds in the open and transplanted later on.

Cucumbers.—Cucumbers may be sown in the open, but in the cooler parts may require to be shaded at night. After the ground is ploughed the hills should be well worked up with hoes to a depth of 18 inches, and about three feet in diameter; these hills should be about eight feet apart each way. A quantity of manure should be worked into each hill before sowing the seed; about a dozen seeds should be sown in each hill and covered to a depth of half an inch. When up thin out to six plants; keep a look out for cut worms, which are very destructive at this stage.

Rock Melons.—These can be sown at the end of the month, and require about the same treatment as cucumbers.

Onions.—Sow a few seeds in seed bed for future use, and plant out those in the beds that are ready.

Peas.—Sow a few rows of quick-growing varieties in the cooler districts.

Potatoes.—If potatoes are not already planted they should be put in at once, as it is now getting late. Use medium size, healthy potatoes, free from scab; plant about six inches deep, in rows three feet apart and 16 inches in the rows. They require a good supply of stable manure placed in the drill, and also some artificial manure containing a good percentage of potash.

Pumpkins and Marrows.—Early varieties should be sown; the hills should be made in well-worked land, all couch grass and other weeds taken out, and a handful of superphosphate worked into each hill before sowing the seed. For strong running varieties the hills should be 12 feet apart each way, while for the more bushy varieties 8 x 8 feet, or 6 x 6 feet is often sufficient. There are a great number of varieties of pumpkins and squashes to choose from, but the Ironbark is about the best for table. An article on the cultivation of pumpkins and squashes appeared in the June number of the *Journal*.

Sweet Potatoes.—Place tubers in seed bed to obtain cuttings if you have not already done so.

Tomatoes.—The plants raised for the main crop should now be ready for transplanting, and should be planted out as soon as possible; a little more seed may be sown to plant out later on.

Water Melons.—May now be sown; they should be planted the same as described for pumpkins. There are a great number of varieties. They should not be planted in the same garden as preserving melons, as they become cross-fertilised with them and are useless.

Farm.—Work on the farm should now be brisk preparing the land for the sowing of the summer crops. Sugar beets and mangels, if not already sown, should be put in without delay, as it s getting late. Maize may be sown for grain and green fodder;

the best varieties for grain are Golden King and Golden Surprise, and for green fodder the white varieties, Hickory King and Giant Caragua. As mentioned in the July issue of the *Journal*, the Department has imported a quantity of the celebrated Cuzco or Peruvian maize, which will be available for distribution during this month. Sorghum for early feed and seed, Hungarian Millet, Buckwheat, Sunflowers and Chicory should all be sown during the month. A good crop of pumpkins and melons should be sown; these are a very profitable crop, easy to harvest, and require very little attention when once sown. Land should be prepared for sowing next month such crops as cow peas, lima beans, soy beans, etc., which are a very valuable crop for improving the soil. Lucerne can still be sown in the moister districts where the land is thoroughly cleaned; it is useless to sow lucerne on soil that is full of weeds. The present time is a very good one for sowing the Golden Crown Grass *(Paspalum dilatatum)*. This seed can now be obtained in quantities in Perth at a rate that places it within the means of everybody, and is a grass that should be planted by every farmer who requires summer food for his stock. The *Paspalum Virgatum*, another good grass that is worthy of attention, should also be planted, either by planting out roots or by sowing the seed.

THE CLIMATE OF WESTERN AUSTRALIA DURING JULY, 1902.

Very stormy weather in South-West districts characterised the first half of the month, a succession of "lows" passing from West to East just South of Cape Leeuwin. On the 9th a "low" apparently passed just North of the Leeuwin, which is very unusual. The wind at that station was North-North-East at 4 p.m., East-South-East (moderate) at 6 p.m., and South-South-West (moderate) at 8 p.m., increasing later to a strong gale from that quarter, and raising a tremendous sea. The rainfall at Perth was abnormally heavy, the record for the first 17 days of the month being as follows:—

1st	... 137	7th	... 101	13th	... *Nil*
2nd	... 13	8th	... 16	14th	... 96
3rd	... 229	9th	... *Nil*	15th	... 95
4th	... 8	10th	... 160	16th	... 20
5th	... 14	11th	... 62	17th	... 15
6th	... *Nil*	12th	... 1		

The last of these "lows" passed on the 15th, and then a high pressure system succeeded, which gradually increased in intensity until, on the 22nd, the barometer was generally higher throughout the State than has ever previously been recorded. This great anti-cyclone very slowly moved Eastward; accompanied by magnificent fine weather, with, however, sharp frosts at night, especially inland. A "low" passed along South of the coast on the 27th and 28th, breaking up the fine weather, and bringing some showers to all South West and South coastal districts.

On the whole, the atmospheric pressure was above the average for previous years throughout the State. The temperature was rather below the normal, except in the tropics, where it was considerably in excess. The rainfall was far above the previous average in the South-West corner of the State, but elsewhere it was about normal. None fell in the tropics.

Heavy frosts were experienced inland during the anti-cyclonic weather of the latter half of the month.

The following table shows the mean and absolute lowest reading of a minimum thermometer placed upon the surface of the ground:—

TERRESTRIAL MINIMUM TEMPERATURE.

Station	Mean.	Lowest.	Date.
Cue	38·3	30·5	20
Coolgardie	35·2	24·0	30
Southern Cross	31·7	21·0	30
Walebing	33·6	23·0	31
York	36·2	26·8	24
Perth Observatory	42·3	32·1	24
Bridgetown	36·9	28·0	23
Karridale	42·0	28·0	22
Katanning	34·4	24·0	24, 25, 30

The Climate of Western Australia during July, 1902.

Locality.	Barometer (corrected and reduced to sea level). Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. July, 1902. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	30·060	30·020	30·340	29·944	86·6	66·9	76·8	93·5	60·5	87·6	63·4	107·0	50·0	Nil	2169
Derby	30·046	30·031	30·241	29·912	88·1	57·3	72·7	92·2	48·0	83·7	57·0	99·0	42·0	Nil	2222
Broome ...	30·062	30·037	30·289	29·934	82·7	57·0	70·0	89·0	47·0	79·5	56·4	91·2	38·0	Nil	2212
Condon ...	30·111	30·089	30·364	29·994	79·6	48·2	63·9	88·2	38·0	74·8	48·3	88·0	38·0	Nil	2074
Cossack ...	30·138	30·078	30·438	29·910	77·8	54·2	66·0	85·1	43·9	74·5	56·6	92·0	45·0	Nil	1297
Onslow ...	30·150	30·118	30·398	29·979	77·4	50·8	64·1	85·2	42·0	76·2	49·6	88·0	39·0	6	392
Carnarvon ...	30·184	30·096	30·418	29·969	71·9	49·7	60·8	81·5	43·3	75·4	49·6	86·0	37·0	47	779
Hamelin Pool...	30·195	30·132	30·474	29·966	69 4	48·1	58·8	77·4	39·0	69·1	48·2	77·2	36·6	95	441
Geraldton ...	30·208	30·152	30·612	29·875	67·6	50·0	58·8	75·0	37·5	67·5	49·8	81·0	34·9	402	1156
INLAND:															
Hall's Creek ...	30·138	...	30·427	29·977	80·9	...	...	89·2	...	75·9	48·1	92·0	35·0	Nil	1369
Marble Bar ...	...	...	...	...	81·3	50·8	66·0	87·0	38·0	...	...	...	...	Nil	1165
Nullagine ...	30·149	...	30·487	29·969	75·9	43·0	59·4	82·0	29·0	69·7	44·6	82·0	31·9	Nil	1266
Peak Hill ...	30·222	30·192	30·581	29·898	66·5	44·1	55·3	76·4	39·5	63·8	43·2	78·3	34·0	Nil	1776
Wiluna ...	30·222	...	30·659	29·873	65·6	37·7	51·6	77·4	28·6	...	...	...	...	Nil	124
Cue	30·246	30·186	30·598	29·925	65·8	43·3	54·6	74·4	34·0	66·1	44·4	78·2	33·2	73	796
Yalgoo ...	30·228	30·176	30·611	29·947	64·4	41·5	53·0	71·8	33·6	64·9	42·3	78·0	32·0	95	490
Lawlers ...	30·222	30·200	30·702	29·803	64·3	40·5	52·4	77·4	32·0	63·2	41·8	78·0	31·6	22	903
Laverton ...	30·224	...	30·739	29·821	62·6	39·4	51·0	76·6	30·9	...	...	...	...	43	885
Menzies ...	30·236	30·202	30·765	29·932	61·9	40·3	51·1	60·6	34·1	62·4	42·2	77·0	32·0	11	864
Kalgoorlie ...	30·232	30·195	30·778	29·852	61·1	41·2	51·2	70·0	31·4	62·2	42·6	76·2	32·6	41	647
Coolgardie ...	30·208	30·184	30·752	29·831	10·8	40·4	50·6	75·6	31·9	61·8	41·6	75·3	32·8	64	676
Southern Cross	30·216	30·196	30·736	29·788	60·9	37·0	49·0	67·2	25·0	63·1	38·7	79·0	27·0	115	726
Walebing ...	...	...	...	...	61·9	38·5	50·2	70·0	28·2	...	...	...	...	354	768
Northam ...	...	...	...	...	66·3	41·9	50·0	68·8	30·2	...	...	...	...	359	653
York	30·186	30·158	30·737	29·850	61·2	38·9	50·0	68·5	29·8	60·5	40·5	71·2	27·0	369	712
Guildford ...	...	...	...	...	63·8	41·9	52·8	71·0	32·8	...	...	...	...	750	1622

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during July, 1902—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					July, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens	30·188	30·144	30·728	29·839	62·1	45·8	54·0	67·2	38·2	63·9	46·0	75·2	33·0	995	1867
Perth Observatory	30·194	30·146	30·729	29·839	62·0	46·5	54·2	67·8	38·2	63·4	47·7	73·8	38·1	1090	1986
Fremantle ...	30·184	30·130	30·686	29·806	61·6	49·8	55·7	67·0	42·8	62·3	48·7	71·0	37·0	956	1766
Rottnest ...	30·161	30·104	30·699	29·782	61·5	52·2	56·8	66·0	45·4	62·8	50·6	72·5	38·0	839	1678
Mandurah ...	...	...	...	...	62·0	45·2	53·6	66·6	35·0	...	...	...	...	770	1845
Wandering ...	...	...	...	...	55·7	36·1	45·9	65·0	27·8	...	...	...	...	556	1112
Collie	...	...	...	...	58·4	36·4	47·4	64·1	29·3	...	...	..	...	892	1795
Donnybrook ...	...	...	...	...	60·1	40·1	50·1	64·5	30·6	...	...	...	...	948	2087
Bunbury ...	30·169	30·118	30·726	29·745	61·1	45·6	53·4	66·2	35·5	62·2	46·1	73·0	32·0	729	1790
Busselton ...	...	...	...	...	60·3	44·3	52·3	65·0	34·2	...	...	...	...	960	1916
Bridgetown ...	...	...	...	...	59·6	39·0	49·3	65·0	30·0	...	...	...	...	934	2011
Karridale ...	30·117	30·100	30·691	29·696	60·3	46·9	53·6	67·0	33·2	61·5	46·7	70·8	31·0	1212	2980
Cape Leeuwin	30·072	30·046	30·702	29·525	60·3	52·6	56·4	65·0	45·7	61·7	52·8	70·6	43·0	953	2101
Katanning ...	30·140	30·112	30·730	29·730	57·5	40·7	49·1	62·8	31·0	58·9	39·3	68·2	25·0	334	767
Albany ...	30·110	30·098	30·769	29·676	60·1	44·7	52·4	66·9	36·0	59·0	45·6	73·5	30·0	745	2381
Breaksea ...	30·084	30·074	30·794	29·524	59·0	49·2	54·1	70·8	40·8	60·2	49·5	71·8	40·8	467	1607
Esperance ...	30·130	30·135	30·735	29·669	62·8	45·5	54·2	68·8	35·6	62·5	44·8	77·6	31·0	253	1370
Balladonia ...	30·172	...	30·699	29·764	62·0	39·1	50·6	76·5	31·4	...	...	...	...	91	682
Eyre	30·162	30·178	30·740	29·810	63·2	43·2	53·2	78·2	34·0	61·7	40·7	73·5	27·2	85	906

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
6th August, 1902.

W. E. COOKE,
Government Astronomer.

RAINFALL for June, 1902 (completed as far as possible), and for July, 1902 (principally from Telegraphic Reports).

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
East Kimberley:				
Wyndham ...	15	1	Nil	...
6-Mile	Nil	...	Nil	...
The Stud Station	...	...	...	...
Carlton	...	...	...	..
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	4	1	Nil	...
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	Nil	...	Nil	...
Flora Valley ...	...	...	...	...
Ruby Creek ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	11	...	...	...
West Kimberley:				
Beagle Bay ...	...	...	...	...
Obagama ...	40	2	...	...
Derby	30	1	Nil	...
Yeeda	...	...	...	...
Liveringa ...	Nil	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	7	1	...	...
Fitzroy Crossing	4	2	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	170	2	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	187	1	Nil	...
North-West:				
Wallal	153	1	Nil	...
Condon	55	2	Nil	...
De Grey River ...	90	1	...	...
Port Hedland ...	76	2	Nil	...
Boodarie ...	58	1	...	...
Yule River ...	...	...	...	...
Warralong ...	60	1	...	...
Muccan	...	...	...	...
Ettrick	47	1	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Pilbarra	Nil	...	...	...
North-West—*cont.*				
Coongon	35	1	...	...
Warrawagine ...	...	...	...	...
Braeside... ...	...	...	...	...
Bamboo Creek ...	46	1	Nil	...
Marble Bar ...	44	1	Nil	...
Warrawoona ...	58	1	...	...
Corunna Downs...	40	1	...	...
Nullagine ...	51	2	Nil	...
Yandicoogina ...	66	2	...	...
Tambourah ...	...	...	...	...
Kerdiadary ...	...	...	...	...
Roy Hill... ...	27	2	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	...	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	40	2	...	...
Millstream ...	55	1	...	...
Yandyarra ...	106	1	...	...
Mallina	Nil	...	...	...
Whim Creek ...	Nil	...	Nil	...
Cooyapooya ...	Nil	...	...	...
Woodbrooke ...	Nil	...	...	...
Croydon	22	1	...	...
Balla Balla ...	4	1	Nil	...
Roebourne ...	24	2	Nil	...
Cossack	17	2	Nil	...
Fortescue ...	7	1	45	2
Mardie	25	1	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	50	1	...	...
Onslow	38	2	6	1
Peedamullah ...	36	1	...	...
Red Hill	40	1	...	...
Mt. Mortimer ...	14	3	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	30	2	...	...
Yanrey	...	...	...	...
Point Cloates ...	166	5	...	...
Gascoyne:				
Winning Pool ...	290	3	Nil	...
Towara	...	...	...	...
Ullawarra ...	30	3	...	...
Maroonah ...	...	...	...	...
Thomas Police St'n	...	...	...	...

RAINFALL—*continued.*

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
Gascoyne—*contd.*				
Bangemall	...	...	...	...
Mt. Augustus	100	4	...	...
Minnie Creek	5	2	...	...
Yanyeareddy	87	4	...	...
Williambury	24	3	...	...
Wandagee	...	...	...	..
Bernier Island	246	5	...	...
Boolathana	...	...	...	...
Carnarvon	283	5	47	4
Cooralya	...	...	...	...
Doorawarrah	11	2	...	...
Mungarra	8	2	...	...
Clifton Downs	4	2	...	...
Dairy Creek	...	...	...	...
Mt. Clere	...	...	...	...
Errivilla	28	2	...	...
Dirk Hartog Island	134	5	...	...
Sharks Bay	135	2	90	4
Kararang	115	6	...	...
Meedo	56	4	...	...
Tamala	...	...	...	...
Wooramel	105	3	92	6
Hamelin Pool	66	4	95	7
Byro	32	1	...	...
Yarra Yarra	46	2	...	...
Berringarra	27	2	...	...
Mt. Gould	15	2	...	...
Moorarie	...	...	...	...
Wandary	48	4	...	...
Peak Hill	94	4	Nil	...
Horseshoe	97	3	...	...
Abbotts	56	2	Nil	...
Belele	...	...	...	...
Mileura	42	2	...	...
Milly Milly	27	1	...	...
Manfred	36	1	79	3
Meelya	...	...	...	...
Woogorong	...	...	...	...
Boolardy	...	...	...	...
Billabalong	41	1	...	...
Wooleane	45	1	...	...
Murgoo	68	2	91	2
Meeka	58	2	116	4
Mt. Wittenoom	58	2	108	3
Nannine	52	3	17	2
Star of the East	50	3	19	2
Annean	...	...	...	...

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
Gascoyne—*contd.*				
Tuckanarra	25	2	18	1
Coodardy	Nil	...	...	...
Cue	39	3	73	2
Day Dawn	19	1	65	2
Lake Austin	45	1	60	2
Lennonville	29	2	85	5
Mt. Magnet	7	1	63	3
Warracoothara	...	...	...	...
Challa	22	1	...	...
Youeragabbie	Nil	...	...	...
Murrum	Nil	...	...	...
Burnerbinmah	13	3	77	4
Yalgoo	22	2	95	...
Gabyon	45	2	...	...
Barnong	46	2	...	...
Gullewa	...	...	...	...
South-West Division (Northern Part):				
Murchison House	277	5	...	...
Mt. View	132	5	...	...
Yuin	25	2	...	...
Northampton	202	5	321	9
Mt. Erin	...	...	...	...
Oakabella	103	4	...	...
Narra Tarra	208	5	...	...
Tibradden	...	...	...	...
Sand Springs	102	6	...	...
Mullewa	71	5	185	12
Kockatea	46	3	50	...
Bootenal	155	5	386	10
Geraldton	234	8	402	14
Greenough	...	...	447	11
Dongara	89	4	392	10
Dongara (Pearse)	138	5	371	12
Strawberry	81	2	...	...
Mingenew	91	6	371	13
Rothesay	...	...	...	...
Field's Find	46	3	...	...
Carnamah	83	6	294	16
Watheroo	121	9	266	13
Dandaragan	211	9	559	15
Moora	175	7	266	10
Yatheroo	213	8	666	17
Walebing	212	7	354	16
New Norcia	174	9	539	14

RAINFALL—*continued*

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	331	9	1084	15
Belvoir	351	10	740	18
Mundaring ...	367	10	...	...
Guildford ...	305	10	750	16
Kalbyamba ...	348	10	990	19
Canning W't'r'w'ks	415	10	1115	16
Perth Gardens ...	357	10	995	19
Perth Observatory	366	10	1090	21
Subiaco	422	10	960	19
Claremont ...	322	8	953	21
Claremont (Richardson)	245	5	862	15
Fremantle ...	328	11	956	21
Rottnest	433	12	839	23
Armadale ...	332	10	932	16
Rockingham ...	485	10	930	20
Canning River ...	562	9	...	...
Jarrahdale ...	497	7	1101	18
Mandurah ...	365	12	770	19
Pinjarra	342	12	824	19
Yarloop	495	11	694	19
Harvey	530	12	761	22
South-West, Central Part (Inland):				
Hatherley ...	113	4	...	...
Momberkine ...	101	3	309	13
Mouglin ...	121	7	...	...
Culham	152	6	414	13
Newcastle ...	179	10	461	16
Eumalga ...	172	8	346	15
Northam ...	111	5	359	16
Grass Valley ...	113	5	300	14
Meckering ...	104	4	255	12
Cunderdin ...	42	1	...	...
Doongin	82	2	288	10
Cuttening ...	...	...	202	16
Whitehaven ...	105	3	...	...
Sunset Hills ...	122	4	...	...
Cobham	132	7	389	18
York	166	7	369	16
Beverley ...	170	7	377	14
Barrington ...	177	6	...	...
Sunning Hill ...	108	6	375	13
Wandering ...	216	9	556	16
Pingelly ...	101	...	399	14
Marradong ...	267	7	632	17

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
South-West—*contd.*				
Bannister ...	211	10	...	...
Narrogin ...	156	8	348	17
Wickepin ...	148	6	353	15
Gillimaning ...	85	4	...	...
South-West Division (Southern Part):				
Bunbury ...	416	11	729	21
Collie	291	12	892	23
Salvation Army Settlement	294	14	...	...
Glen Mervyn ...	408	12	821	13
Dardanup ...	367	9	860	18
Donnybrook ...	423	12	948	20
Boyanup ...	402	13	...	...
Busselton ...	427	18	960	24
Margaret River	...	...	...	...
Lower Blackwood	480	13	...	...
Karridale ...	711	26	1212	28
Augusta ...	429	22	1031	27
Cape Leeuwin ...	388	24	953	28
Biddellia ...	678	17	...	...
The Warren ...	661	15	...	...
Lake Muir ...	256	14	595	25
Mordalup ...	251	14	...	...
Deeside	274	16	639	26
Riverside ...	278	17	662	22
Balbarup ...	331	17	798	22
Wilgarup ...	353	16	744	24
Mandalup ...	377	14	...	...
Bridgetown ...	290	18	934	24
Greenbushes ...	374	12	908	18
Greenfield ...	312	10	520	14
Glenorchy ...	269	6	...	...
Williams ...	174	9	484	17
Arthur	162	4	378	...
Darkan	219	9	...	...
Wagin	117	9	386	15
Glencoe ...	133	9	334	16
Dyliabing ...	106	9	271	16
Katanning ...	149	10	334	15
Kojonup ...	207	10	468	15
Broomehill ...	112	11	803	16
Sunnyside ...	111	9	367	17
Woodyarrup ...	128	12	303	14
Cranbrook ...	172	10	...	...
Blackwattle ...	205	7	...	...
Mt. Barker ...	339	18	556	20
Kendenup ...	287	17	447	20

RAINFALL—*continued.*

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
South-West—*contd.*				
St. Werburgh's...	318	17	470	19
Forest Hill ...	358	19	660	26
Denmark ...	338	15	...	...
Albany	488	19	745	19
Point King ...	471	16	779	18
Breaksea ...	309	20	467	21
Wattle Hill ...	...	...	...	...
Cape Riche ...	404	13	...	...
Pallinup ...	124	11	...	...
Bremer Bay ...	331	16	253	15
Jarramongup ...	105	10	237	12
Eastern Division:				
Lake Way ...	133	5	Nil	...
Mt. Sir Samuel ...	198	4	8	2
Lawlers	182	5	22	2
Leinster G.M. ...	193	2	Nil	...
Lake Darlôt ...	...	...	...	...
Diorite King ...	...	...	...	...
Sturt Meadows...	...	...	...	...
Mt. Leonora ...	185	6	41	3
Mt. Malcolm ...	188	3	...	...
Mt. Morgans ...	249	4	47	4
Burtville ...	...	...	...	...
Laverton ...	214	5	43	3
Murrin Murrin...	246	6	63	3
The Granites ..	136	4	...	...
Tampa	199	3	...	...
Kookynie ...	165	3	50	4
Niagara	161	4	...	...
Yerilla	215	6	53	4
Edjudina ...	196	6	...	...
Menzies	96	5	11	...
Mulline	107	3	38	2
Wangine ...	...	...	...	...
Waverley ...	65	3	31	3
Goongarrie ...	90	5	36	4
Mulwarrie ...	120	3	61	5
Kurawa	31	3	37	5
Dixie Gold Mine	...	...	. .	...
Kurnalpi ...	43	4	...	...
Bulong	36	4	46	5
Kanowna ...	47	5	36	5
Kalgoorlie ...	25	1	44	5
Coolgardie ...	136	5	64	7

Stations.	June. No. of points. 100 = 1in.	June. No. of wet days.	July. No. of points. 100 = 1in.	July. No. of wet days.
Eastern—*contd.*				
Burbanks P.O. ...	170	4	68	7
Burbanks Birth-day Gift	173	2	65	6
Woolubar ...	12	1	63	5
Widgiemooltha...	198	6	75	7
50-Mile Tank ...	100	5	89	7
Norseman ...	74	6	78	8
Bulla Bulling ...	...	...	...	...
Woolgangie ...	238	3	96	5
Boorabbin ...	233	8	82	8
Karalee	205	4	...	...
Yellowdine ...	95	2	116	6
Southern Cross...	128	4	115	10
Mt. Jackson ...	37	2	83	4
Bodallin ...	47	3	89	4
Burracoppin ...	...	...	...	...
Kellerberrin ...	86	5	186	9
Mangowine ...	59	4	...	...
Wattoning ...	...	...	...	...
Eucla Division:				
Ravensthorpe ...	143	12	197	12
Coconarup ...	84	9	...	...
Hopetoun ...	287	15	217	16
Fanny's Cove ...	461	12	...	...
Park Farm ...	457	17	...	...
Esperance ...	400	15	253	13
Gibson's Soak ...	385	13	...	...
30-Mile Condenser	343	13	...	...
Swan Lagoon ...	150	13	...	...
Grass Patch ...	145	15	...	...
Myrup	503	14	...	...
Lynburn ...	414	10	...	...
Boyatup... ...	431	14	687	18
Middle Island ...	...	...	...	...
Point Malcolm ...	462	12	...	...
Israelite Bay ...	427	11	59	6
Bulbinia ...	...	...	...	...
Frazer Range ...	...	...	...	...
Balladonia ...	76	8	91	7
Southern Hills...	59	4	...	...
Eyre	349	17	85	11
Madura	...	...	...	
Mundrabillia ...	...	...	...	...
Eucla	163	12	27	7

The Observatory, Perth,
6th August, 1902.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during July, 1902.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	8471	7510	961	961	5637	...	1532	...	...	93	...	197	32	19	...	...	...	...	...
Albany	123	119	4	4	22	...	33	...	...	12	...	51	...	...	...	...	...	1	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hamelin	...	...	...	...	..	...	...	...	...	...	...	..	...	...	...	...	...	...	...
Busselton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bunbury	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	8594	7629	965	965	5659	...	1565	...	...	105	...	248	32	19	...	...	...	1	...

Department of Agriculture,
8th August, 1902.

Return of Fruit Trees and Plants imported into Western Australia during July, 1902.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.															
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	34	16102	33	15883	2	219	...	4563	95	2924	304	52	...	200	...	12	4481	1442	450	214	1045	...	101
Albany ...	15	9201	14	9135	1	66	...	118	20	5332	168	111	6	10	7	7	87	825	690	318	1298	...	138
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hamelin ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Busselton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bunbury ...	2	1610	2	1610	...	...	...	6	...	161	36	...	...	...	...	...	60	24	2	...	1275	...	46
Esperance ...	1	96	1	96	...	...	...	...	...	...	12	12	...	...	...	...	...	24	...	...	48	...	...
Total ...	52	27009	50	26724	3	285	...	4687	115	8417	520	175	6	210	7	19	4628	2315	1142	532	3666	...	285

Department of Agriculture,
8th August, 1902.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

Agricultural Societies' Meeting Nights.—Secretaries of Agricultural Societies are again requested to send in the dates and places of the meetings of their respective Societies. A list of those already sent in appears in this issue immediately following the list of Societies at the end of the Journal.

Planting Sweet Corn.—In order to secure a succession throughout the season, three varieties of sweet corn should be planted. "Burpus Earliest of All" and "Country Gentleman" are planted end of August and beginning of September. "Stowell's Evergreen" about three weeks or a month later. The seed should be planted in drills, and, when well up, thinned to eighteen inches apart; rows should not be closer than three feet.

Profit from Irrigation.—Some of the advantages of irrigation may be obtained from the following extract from a speech of Prof. C. W. Child, at Santa Clara Farmers' Institute:—"Eight or nine years ago I examined the rivers of Santa Clara county, and induced my neighbours to assist me in bringing water down from the hills near Almaden. People were slow to come in, but we got our company organised, and in four years our ditch was finished. We find that it costs about one-tenth as much to irrigate from the ditch as from the wells, and from the ditch there is the great advantage derived from the sediment. As to the practical results of irrigation: When the last dividend was declared by the California Cured Fruit Association I received about three times as much money from a given acreage than my neighbour, who did not irrigate, the difference being in my favour both in size and weight."

Sulphuring.—The use of sulphur as a check and remedy for "red spider" and all leaf-eating mites, mildew, and all other external fungi upon trees and plants is well known to horticulturists, and was generally applied to the affected trees by the use of sulphur bellows or dusted from a sack at the end of a pole. It remained for Mr. Geo. Ditzler, of the Rio Bonito orchards, Biggs, Butte county, to invent a machine that distributed the sulphur in a wholesale manner. Mr. Ditzler's machine is an ordinary grain-sower, with several attachments of his own invention. The machine is mounted upon a wagon drawn by two horses and operated by gear from the wheels. Mr. Ditzler claims that he can sulphur more trees in one hour than 100 men could in a day, and do it more thoroughly. The various parts of the machine are figured in Bulletin No. 67 of the State Board of Horticulture. There is no patent on the device, so any one is at liberty to make it.

Wintering the Dry Cows.—The time has again come round when the dry cows suffer. Every effort should be made to

keep them in condition during the next two months. Those who have a few turnips or mangolds, or a patch of green rye or barley and a straw stack are right. Ever such a little of the roots or green stuff, with a full ration of the straw, will tell. Straw alone is a poor provender for an in-calf cow; it is the next worst thing to a poor bush run; but good straw and even a couple of fair-sized mangolds or turnips a day will keep the cows in healthy condition, ready to respond to the influence of spring grass when it comes. Where the roots or green stuff is not available, now is the time to begin preparation for next year by a first ploughing for either; in the case of greenstuff from now till the seed is sown in March and April the lands must be kept worked to ensure success.—*Agricultural Gazette.*

Experimental Plot at Gingin.—Mr. A. W. Edgar, of Strathalbyn, having asked for an experimental plot to be established in the Gingin district, and having also offered to supply the land and cultivate it free of charge, the Hon. Minister for Lands has approved of an experimental plot being carried out at Gingin for a period of twelve months. In accordance with the Minister's decision, an acre of land has now been planted with a variety of crops in this district. The crops include a large number of grasses, lucerne, sorghum, cow-pea, and other fodder crops likely to prove of benefit for grazing or stock feeding purposes; also some maize and other crops to test the suitability of the district for their growth. Notes will be taken from time to time, and reports will be published during the growth of the crops. Plots such as these should prove both instructive and interesting to local settlers, enabling them to see all kinds of crops growing in their district, and to take full advantage of the results at no expense to themselves.

Strange Death of a Cow.—Cows suicide involuntarily by swallowing all sorts of strange indigestible things; in fact, the modern cow is beginning to rival the ostrich and the emu in its craving for scrap iron, clothes, horseshoes, nails, and so forth. The most remarkable case that has yet been reported, however, occurred recently in the Moruya district. Mrs. E. Hawdon, of Coila, had some cows near a lake, and one of these was found dead. The cow was in good condition, and there being no cause of death apparent, *post-mortem* examination was made. All the organs were perfectly healthy, but in the throat of the animal was found a good-sized cat-fish. The cow had probably picked up the fish in the lake, and had endeavoured to swallow it. Unfortunately for the cow, she began to swallow the fish tail first, and the fins prevented her from passing it down. The fish stuck, and the cow was choked to death. An interesting question is raised by the remarkable number of singular cases of this character reported during the last few years. The recurrence seems to indicate that cows are becoming more prone to seek foreign substances to gratify an abnormal appetite, and this abnormal appetite is probably a result of the development of the

qualities of the animal. Of course it is possible that the cow, when devoted to the purpose for which nature intended her, rearing a calf each year, might have had a burning desire to swallow bones, boots, clothes, and so forth. But there is no evidence that the propensity existed prior to stall-feeding and hand-milking. Moreover, it is the most highly-developed stud milch cattle that evinces the most rapacious yearning for unnatural foods. It is unsafe to leave any loose article lying around in a stud enclosure, and on many stud farms the fences are planed off so that the cows cannot pick splinters from the rails to lick and swallow. A number of attempts have been made to introduce the something, the lack of which makes the cow seek out-of-the-way things to eat. Phosphates were popular for a time, but the results have not been satisfactory, and the mysterious craving has not been effectually checked.

Points in Pig-Breeding.—Breeding and feeding must necessarily go together. Feeding is, of course, of immense importance, for there are certain things that can be had only through feeding, and without proper feeding no breeding is of much avail. But there are certain things that just as surely come from breeding and from no other source. The raisers of swine want large litters. These cannot be obtained by feeding. In fact, the tendency of high feeding is to produce smaller litters. Large litters can come only from correct breeding. How important then is it to know something about the ancestors of the animals that are being bred, whether they were the producers of large litters or not. Then we want to get large, strong frames on the animals that are to produce meat. This can be obtained only by breeding from animals that have the frames desired. It is folly to breed from any other kind of an animal and depend on feeding to bring about the desired result. Then also we should have animals of great vitality and with great digestive ability. The breeder only can get this. A hog that has a poor digestive apparatus generally reproduces his like, and that product cannot assimilate food in large quantities. Here especially the "corn-crib argument" utterly fails. If such an animal be fed too much, his system simply breaks down. It does not improve. Good health is largely bred into an animal; it is seldom or never fed in. What we call good health depends upon a good constitution. The good constitution is only another way of saying that the animal has come into life with all of his organs healthy and properly formed for the performance of their function. Probably what we call vitality comes from this perfect formation of each organ. The lungs are then so constructed that they can go on burning up the carbon rapidly and creating energy, which energy in turn keeps every other organ, including the lungs, in action. This peculiar combination we get through breeding. If an animal comes into life with some of its organs inferior in construction we cannot cure that defect. If the lungs are weak they will not assist in the creation of energy. It is thus seen that it is exceedingly important that the animals used for breeding purposes be picked stock.—*Farmers' Review.*

WHAT FRUIT TO GROW.

By A. Despeissis.

The following chapter contains a carefully-selected list of fruits which have either been proved to be successfully grown in the South-West Division of Western Australia or are known to thrive in other fruit-growing countries bearing, with ours, strong features of similarity as regards those natural conditions which are congenial to fruit trees.

The letters E., M., and L. mean early, medium, or late, respectively; S., A., and W. denote summer, autumn, and winter; and F. and C. freestone and clingstone.

STONE FRUITS.

These comprise such fruit as apricots, cherries, peaches, nectarines, plums.

Select Apricots (*Prunus Armeniaca*).

These trees are best worked on apricot root in the warmer and drier districts, as it stands drought fairly well, and is, in moister localities, apt to grow too vigorously. Plum stock stands wet better than the apricot root, has a more dwarfing tendency, and grows fine fruit, but suckers when cultivated too deeply; the union is sometimes imperfect, and it often produces gumming and the die-back diseases. Peach roots do better on lighter soil, and is generally a good stock to work apricots upon. An ideal apricot district is one which is neither too hot nor too cold, neither too dry nor too wet, but one enjoying just a happy mean.

Newcastle Early, E.—The earliest fair size apricot. Ripens a week after Red Masculine, and a fortnight before Oullin's Early Peach. The tree, according to Wickson, is an early, regular, and good bearer; a medium grower, being rather more upright in its habit than the Royal. Fruit full, medium size, round; rich golden yellow, with brilliant red cheek in the sun; freestone; flavour, sweet and rich; three times as large as Red Masculine, not quite as large as the Royal, nor quite as rich in flavour.

Oullin's Early Peach, E., of which there is an improved strain. This is an early form of the Peach Apricot; of large size, most delicious flavour, and ripens three weeks earlier. Like the Peach, a variety from Piedmont; about 2 inches in diameter; roundish, rather flattened and somewhat compressed on its sides, with a well-marked suture. Skin yellow in the shade, but deep orange mottled with dark brown on sunny side. Flesh of a fine yellow saffron in colour, juicy, rich, and high-flavoured. Stone can be penetrated, like Moorpark, and with a bitter kernel. Strongly resembles the Moorpark; fruit rather larger, finer, and earlier. Successful in the warmer districts.

Royal, E.—A fine large French variety, nearly as large as the Moorpark (when well thinned out), but with larger leaves forming

on long footstalks, and without the pervious stone of that sort; quite as high flavoured, and ripens a week or ten days earlier. A favourite with the canners, and an excellent variety for drying. One of the leading Californian apricots, being a freestone, of good pale orange colour and flavour, ripening evenly. Fruit, large, roundish oval, and slightly compressed; skin dull yellow, with orange cheek and a shallow suture.

Blenheim, E. (syn. Shipley.)—A very good early variety, above medium, oval, orange with a deep yellow, juicy, and tolerably rich flesh; good grower, and regular prolific bearer. Fruit runs a little larger than the Royal, and is usually better distributed on the tree, but it must be well thinned. This variety is approved by canners. Ripens a little later than the Royal.

Roman, E. (syn. Early Moorpark).—One of the largest growing and hardiest apricot trees, and bearing good crops where few others succeed. Fruit middle-sized, oblong, with sides slightly compressed, with but little or no texture; skin entirely pale yellow, or very rarely dotted with a few red spots on one side; flesh dull yellow, soft, rather dry; stone oblong with bitter kernel; pronounced to be the best apricot for Southern California, going there under the name "Early Moorpark."

Hemskerk, M.—A large and fine English variety of fine quality, much like the Moorpark, of which it is a variety. Stone not perforated, rather small, and kernel bitter. Esteemed because the tree is more hardy and a more regular bearer than the Moorpark, and the fruit ripens evenly on both sides—unlike the Moorpark too, not liable to gum and die off in the same manner. The reputation this variety enjoys in the Eastern States is not maintained in Western Australia.

Moorpark, M.—A noble apricot, but an uncertain or shy bearer, resembling the Peach Apricot closely, with this difference, that it will grow on the common plum and mussel stock, while the Peach will not, and the Moorpark does not grow on the Damas Noir, while the Peach Apricot does. Fruit ripens middle season; large, roundish, about two inches and a-quarter in diameter each way; rather larger on one side of the suture than the other. Skin orange in the shade, but deep orange and brownish-red in the sun; marked with dark specks and dots. Flesh quite firm; bright orange; parting free from the stone; quite juicy, with a rich and luscious flavour; stone peculiarly perforated at the back, where a pin may be pushed through; kernel bitter. The tree is a rank grower, especially in its earlier years, and shows an amount of vegetation which is not conducive to fruitfulness. It is, besides, tender and very liable to sudden die-back in the spring. The effect arises from sudden shock, like injuries received by the tissues of the wood by late frosts, digging round in wet weather, etc. Bears irregularly, but occasionally carries prodigious crops. Should be planted very sparingly.

Warwick, M.—Large; resembling Moorpark; constant bearer; flesh orange, firm, rich, and sugary.

MRS. HART.—A promising Queensland variety, suitable for the warmer districts of the State. Tree, a vigorous grower and a good cropper.

PALE SUPERB, L. (syn. Camden Superb).—A late Colonial variety of great excellence. Vigorous grower and cropper.

ALSACE, L.—Very large size and first quality fruit; ripens late. It is a variety of the Moorpark, but does not die off in bunches like the Moorpark.

MANSFIELD SEEDLING, L.—Fruit very large, and one of the finest grown. A good bearer and a late one.

SELECT PEACHES (*Prunus Persica*).

These peaches are arranged approximately in the order of ripening.

FLAT CHINA, E., F.—Of which there is an improved variety. Ripens earliest of all—beginning of November. Tree, a strong grower and an early and abundant bearer; for that reason, not a long-lived variety. Suitable for the warmer districts of the State.

BRIGG'S EARLY RED MAY (California), E., F.—The best of early peaches. Ripens middle of November. Fruit medium to large, round; white skin with rich, red cheek; flesh greenish-white, melting, juicy, rich; stone partially free; a standard early variety; subject to mildew. In the coastal districts, West of the Darling Ranges, this variety is a disappointing one, dropping its fruit buds very extensively in certain seasons.

ALEXANDER (American) E., C.—A very early and excellent peach. Fruit medium to large; greenish white, nearly covered with rich red. Flesh whitish, melting, juicy, sweet, the only fault being its adhering slightly to the stone. Two weeks before Hale's Early. Leaves with round glands; flowers large. Its flesh is so tender it quite melts before it can be separated from the stone. Somewhat liable to curl leaf, and drops its fruit buds badly in some seasons.

HIGH'S EARLY CANADA, E., F.—Ripens with Alexander's Early before Christmas; a better bearer than Briggs' Red May.

AMSDEN, E., F.—Medium size, greenish white and bright red on the sunny side; stone separates freely. An American peach; remarkable for its earliness; ripening a fortnight before Hale's Early.

EARLY RIVERS, E., F.—Fruit large size; roundish; marked with a distinct suture; sometimes cracks at the stone. Skin pale lemon yellow, with the slightest blush on one side. Flesh pale, gelatinous, translucent, with white veins through it; very tender and juicy, and with a fine brisk nectarine flavour. One of the finest early peaches. Raised from seed of Early Silver. Too luscious and tender for shipment, but invaluable for the home garden.

HALE'S EARLY (American) E., F.—Tree very hardy; a vigorous grower and abundant bearer, but is liable to rot in some localities. Leaves with round glands; flowers large. Fruit medium, nearly round, greenish, mostly covered with red. Flesh white,

melting, juicy, rich, and sweet. Fair for local market and export. Follows Early Rivers—early in January.

Jones' Early Red, E., F.—Sets well in the coastal districts Westward of the Darling Ranges. Fine colour.

Foster, E., F.—Very widely grown in California, and is especially recommended for canning. Fruit uniformly large; slightly flattened; slight suture; stem moderately depressed; flesh yellow, very rich and juicy; colour deep orange, dark red in the sun; tree hardy and productive. Ripens before Early Crawford, which it somewhat resembles, but is of better quality. Heavy bearer.

Crawford's Early, M., F.—The most splendid of all early yellow-fleshed peaches. Very popular for the garden or the orchard. Tree is vigorous, fruitful, and hardy; leaves with globose glands; flowers small. Fruit very large, oblong, swollen, point at top prominent, suture shallow, skin yellow, with red cheek. Flesh yellow, rich, and excellent.

Royal George, M., F.—Large globular, broad, and depressed; suture deep and broad, extending around two-thirds of the fruit. Skin pale or white, sprinkled with red dots and deep red cheek. Flesh tender, white, but very red at pit, juicy, rich, high flavour; subject to curl leaf.

Mountain Rose, M., F.—A well-coloured, hardy, and valuable medium peach. The product of a cross between Chinese Cling and and Early Crawford, ripening just after the latter.

Shanghai, M., C.—Large yellow peach; skin pale yellowish green on the shaded side, and light red next the sun. Flesh pale yellow, very deep red at the stone, to which some of the strings adhere; melting, juicy, and richly flavoured. Tree a very good bearer. Ripens beginning of February.

Elberta M., F. (Georgia).—Fruit very large; round oval, with deep suture; golden yellow, with enough blush to make it showy. Flesh yellow, red at the pit; excellent flavour. It bears well and ships well; large foliage but subject to curl leaf. Ripens just ahead of Muir towards the middle of February.

Muir (California) M., F.—Fruit large to very large; perfect freestone; flesh clear yellow, very dense, rich and sweet; pit small; tree a good bearer and strong grower, if on rich soil, to which it is best adapted. Fruit a good shipper and canner, and peculiarly adapted to drying, because of exceptional sweetness and density of flesh. Yield 1lb. dry from less than 5lbs. fresh. Ripens end o February.

Lovell, M., F.—Is now running a strong favourite to Elberta in California. Pronounced to be one of the best peaches as a dryer, canner, and shipper. Tree a strong grower, bears heavily and carries the fruit well; for drying it is close to the Muir in weight of dried fruit per pound of fresh, and makes finer dried fruit. Large size, round, yellow. Flesh fine, texture firm, solid, clear yellow to the pit. Said to curl in some places.

Lady Palmerston, L., F.—A fine late English peach; generally flowers small; leaves with kidney-shaped glands. Large, skin greenish-yellow, with a crimson cheek; flesh pale green, rich, and melting.

Comet, L., C.—A very large yellow flesh peach; fine for canning. A seedling from Salway, which it resembles, but is rather smaller, and fourteen days earlier (middle of April).

Salway (English) L., F.—Fruit large, roundish, one side enlarged, suture distinct; creamy yellow, with a marbled rich, brownish-red cheek; flesh yellow, firm, red to pit (somewhat like an apricot), juicy, rich, sweet, vinous. Of great value as a showy late peach.

McKevitt's Cling (California) L., C.—A very large white peach; flesh very firm, fine grained, sugary, and rich high flavour, white to pit; skin strong and fruit excellent for shipping or canning. Tree remarkably strong in growth and free from disease.

Phillip's Cling, L., C.—A highly-commended Californian peach for canning. Fine large yellow cling, no colour at the pit, which is very small; exceedingly rich and high coloured.

Select Nectarines (*Prunus Persica*, var.).

In another part of the journal is given an illustration of a strange commixture or blending of the peach and of the nectarine on the same specimen. Although the peach is the mother of the nectarine, and this latter fruit is generally reproduced by budding, yet it has often been demonstrated that the nectarine can be reproduced from the stone without grafting or budding.

As a rule, the nectarine does not adapt itself so well as the peach to varied surrounding circumstances.

Irrewarra, E., F.—The earliest; ripening middle of January. Medium size, highly coloured, of good flavour.

Lord Napier, E., F.—One of the earliest nectarines, and also one of the largest. A heavy and regular bearer. Large pale cream colour, streaked with blood-red to dark crimson on the sunny side. Flesh white, melting, tender, juicy, separating freely from the stone, and with a rich "Stanwick" flavour. Flowers large; leaf glands kidney-shaped.

Hunt's Tawny, M., F.—An early medium-sized fruit, roundish ovate; skin pale orange, with dark red cheek mottled with numerous russety specks. Flesh deep orange, juicy, melting, rich, and very good; freestone. Serrated leaves without glands, hardy, early, and prolific; flowers small.

Elruge (English), M., F.—Ripens middle season (first week in February), and is one of the finest nectarines. When the young wood is annually shortened in, it bears good crops which ripen well; without this precaution, like almost all other nectarines, the

fruit is small, poor, and ripens imperfectly. Leaves with reniform glands and flowers small. Fruit medium size, roundish oval; suture light, except at the top, where it is distinctly marked. Skin pale green, deep violet in the sun, or blood-red with minute brownish specks. Flesh pale green to the stone, which is free, of oval shape, rough, and pale colour.

Goldmine, M., F.—An excellent New Zealand seedling. Fruit large; freestone; the pit very small. Flesh cream colour, tender, juicy, melting, and delicious flavour. Colour bright bronzy red.

Large White, M., F.—Commended wherever nectarines are grown in California. A fine light-skinned variety. Leaves with reniform glands; flowers large. Fruit rather large, nearly round; skin white, with occasionally a slight tinge of red; flesh white, tender, very juicy with rich vinous flavour; stone small and free. Dessert, canning, and drying. Ripens first week in February.

Stanwick, L., F.—Originated in England from seed brought from Syria. Ripens middle of February. Fruit large, roundish oval; skin pale greenish white, deep violet in the sun; flesh white, tender, juicy, and of good flavour. There is an improved strain of this variety.

Victoria, L., F.—Fruit very large, pale green, of good quality, and a heavy bearer. Ripens middle of February.

Select Cherries (*Prunus cerasus*).

Western Australia has failed so far to establish for cherry culture the good fame she has earned in respect to most other fruits. Were it not for the high prices offered for fresh local cherries the trees would not have proved profitable; they grow luxuriantly and blossom properly, but fail to set a crop, and birds are great lovers of them. I would caution growers in the warmer districts against planting them at all, whilst those located in the cooler and higher districts from Katanning to Mt. Barker and the Lower Blackwood should endeavour to find out which sorts suit the surrounding conditions best. A typical cherry country is a moist one possessed of well-drained slopes covered with deep soil, and one which is not exposed to very great diurnal and nocturnal changes of the temperature. In this latter respect the Western Australian climate may not prove uniform enough for cherry culture, the difference between day and night temperatures often showing variations of 30 to 40 deg. in the early Spring when the cherry blossoms are out. A climate rising at any time to 90 deg. F. whilst the cherry trees are carrying their fruit is unsuitable for cherry culture. It is reasonable to assume that some select or choice West Australian seedlings may embody characters which will suit conditions prevailing here, and thus prove suitable for our requirements. Cherries are the first fruit to ripen after loquats, the season beginning early in November in Western Australia. They are followed up by apricots a few weeks afterwards.

The following are amongst the best Bigarreaux and Hearts:—

California Advance, E.—A seedling of Early Purple Guigne, and not such a shy bearer; one of the best early cherries; ripens last week in October; dark purple, turning black.

Werder's Early Black, E.—A fine early variety; ripens middle of November; fairly good bearer; tree vigorous, spreading; fruit large, black, and of fine flavour.

Chapman, E. (California).—A seedling of Black Tartarian, but a better bearer, and much earlier; ripens after Early Purple Guigne.

Black Eagle, E.—Medium size; deep purple or nearly black, flesh deep purple, tender, juicy; ripens middle of November.

Bigarreau Twyford, E.—Fruit large and of fine quality; pale yellow on the shaded side, red on the side next to the sun; a Victorian seedling, well spoken of; succeeds well in most districts; ripens early in November.

Centennial, M.—A Californian seedling of Bigarreau Napoleon; larger than its parent, more oblate in form, and marbled and splashed with crimson on a pale yellow ground; very sweet, mealy, and possessing good keeping and shipping qualities. Tree a vigorous grower and a prolific bearer. Ripens middle of November.

Bigarreau Napoleon, M. (Syn. Spotted Bigarreau).—A magnificent cherry of the largest size, beautiful appearance and rich flavour. Tree a vigorous grower, very hardy, and not subject to gum; a free bearer. Fruit pale yellow, becoming amber in the shade, richly dotted, and spotted with deep red, and with a bright red cheek; flesh very firm, juicy, and sweet; a good carrier.

St. Margaret, L.—Very late. One of the best late marketing cherries grown, stands carrying well. Fruit very large, obtuse, heart-shaped, uneven on its surface, and considerably flattened next to the stalk on the side marked with the suture. Skin at first dark red, changing to dark blackish purple. Flesh dark purple, adhering firmly to the stone, firm, sweet, and briskly sub-acid.

Florence, L.—Very late, same season as St. Margaret, end of November. A most excellent cherry, originally brought from Florence, in Italy, considerably resembles the Bigarreau, but ripens a little later, and has the additional good quality of hanging a long time on the tree. Tree of moderate size, and of a spreading habit of growth. Fruit pale yellow, mottled with red on shaded side, clear bright red mottled with deeper red on the side next to the sun. Flesh amber colour, firm, rich, sweet, fine flavour, small stone.

Morellos.

Morello, L.—Fruit large, dark red, almost black if left to hang for a long time. Flesh deep purplish red, tender, juicy, and briskly acid. Tree of spreading habit, and great bearer. One of the best for culinary purposes, or making "cherry brandy,"

Select Plums and Prunes (*Prunus*, sp.).

E., M., L., denote early, medium, late respectively; K. cooking; D. dessert fruit.

The distinction as plums and prunes of species of the same genus of plants is somewhat recent. They used to be called plums by English-speaking people, just as in France they are all known as prunes. In France, however, the fruit when dried and cured are known as *pruneau*, and it is thus that in America and other countries the word prune is specifically given to those plums which will cure into a firm, meaty, dried fruit, from which the seed is not removed.

In the descriptions of suitable varieties given below, prominence has been given to those which are dried into prunes, as they also happen to constitute excellent dessert fruit, and being meaty, sweet, and firm, they pack and carry well.

Such varieties as the Robe de Sergent, Fellenberg or Italian Prune, and Silver Prune, a seedling of Coe's Golden Drop, have been left out, as they are shy and disappointing bearers, although they are of excellent quality. In California they are now being as rapidly replaced by more profitable sorts as they were extensively planted a few years ago.

Plums have been classified into different families such as:—

1st. *Prunus domestica*, native of Asia, and the parent of European varieties such as damson, greengages, and varieties commercially known as prunes.

2nd. *Prunus cerasifera*, of which the myrobolan or cherry plum is the type. These are natives of South-Eastern Europe and South-Western Asia, and are used mostly for stocks; they are the parents of Mariana and other varieties, which are either offshoots of this species or hybrids.

3rd. *Prunus triflora*, or the Japanese type.

4th. *Prunus simoni*, or the apricot plum, a native of China.

Greengage (syn. Grosse Reine Claude) M. (said to have been introduced into England by the Gage family).—Universally admitted to hold the first rank in flavour among all plums. Tree short-jointed and vigorous; of spreading and rather dwarfish habit. An abundant and pretty regular bearer, though the fruit is a little liable to crack upon the tree in wet seasons. Branches smooth; buds with large shoulders. It is said to be improved by being grafted on the apricot, and requires thinning to attain perfection. Ripens middle season. Fruit round, rather small, suture faintly marked. Skin green, or yellowish-green at full maturity, usually with reddish-brown dots and network at base; stalk half to three-fourths inch, scarcely sunk. Flesh pale green, melting, juicy, exceedingly rich, and flavour excellent, usually separates freely from the stone.

PRUNE D'AGEN, Fig. 1 (syn. French Prune, Prune d'Ente), L.—Ripens end of March. The most propagated in the Valley of the Lot in France and also in California. Tree of moderate growth. Young shoots dense, smooth. Very productive. Fruit medium size, oval, slightly necked, suture small. Skin violet purple, covered with a thick bloom and numerous small dots. Stalk nearly an inch long, a little curved, set in a small depression. Flesh greenish-yellow, juicy, sugary, rich and delicious, slightly adherent to the stone. Ripens middle season. The best of all prunes. When cured contains 35 to 50 per cent. sugar. When fresh 15 to 30 go to the pound, and 45 to 75 to the pound cured, with a ratio between cured and fresh fruit of 2·55 to 2·90.

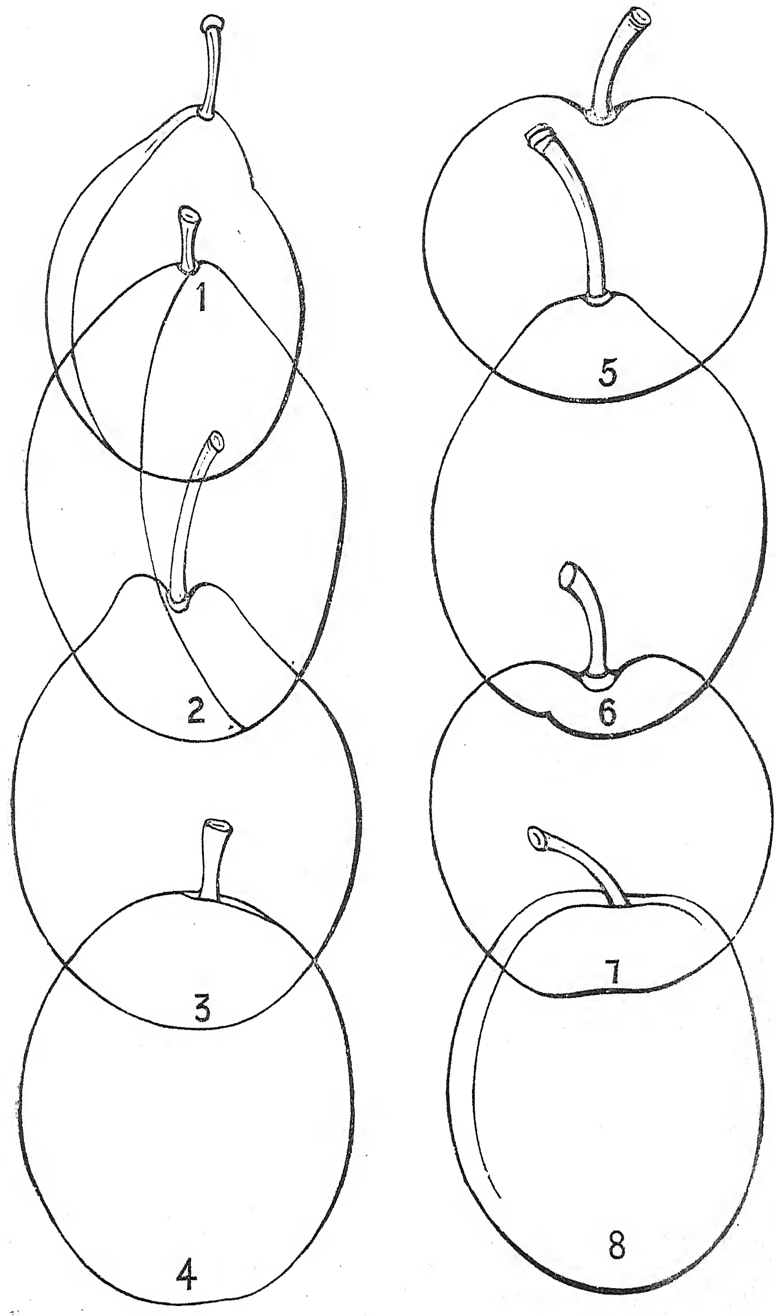
SPLENDOR (Fig. 2.)—A cross between the Prune d'Agen, fertilised Pond, or Hungarian Plum. Tree vigorous and uniform in growth; not so thick as the Prune d'Agen, which it resembles. Fruit freestone, ripens two weeks earlier than its parent, and much larger. It is a clear, even red, and turns quite black in curing. Highly spoken of for drying, shipping, market, and as a dessert fruit. The following comparison between the Splendor and the Prune d'Agen is by Mr. G. Colley, of the Cal. Univ. Exp. Station :—

	Splendor.	French.
Number per lb.	15·75	19·20
Flesh, per cent.	95·70	94·20
Pits ,, ,, ...	4·30	5·80
Juice ,, ,, ...	88·0	83·1
Pulp ,, ,, ...	12·0	16·9
Sugar, per cent. in juice	22·87	23·69
,, ,, ,, in flesh	20·13	19·70
,, ,, ,, whole fruit	19·27	18·50

This shows that the fruit is closely comparable with the French prune. The Splendor is greater in juice, and would probably lose more in drying. The exact drying value of the prune must be determined in practice. The acid in both prunes is identical, and from this fact, and what is given above, the two fruits belong to the same class in richness and flavour.

POND'S SEEDLING (syn. Hungarian Prune), Fig. 3, L., K.—Late English sort. Tree very vigorous and productive; a beautiful red, large, ovate fruit, slightly tapering to the stalk. Skin thick, reddish violet, with numerous brown dots, and covered with a thick bloom. Flesh course, adhering to the stone. Branches smooth, grayish. Sells well on appearance.

IMPERIAL EPINEUSE (Fig. 4.), M.—A strong grower, upright, stocky growth, with an inclination to make lateral spurs, giving the tree a thorny appearance. Wood darker in colour than Prune d'Agen. Fruit very large, reddish purple, firm and sweet; very similar to Clairac Mammoth. Of this prune, 10 go to the pound fresh, and 25 to the pound cured, with a ratio between cured and fresh fruit of 2·53.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Reine Claude de Bavay, Fig. 5 (Belgium), L.—A most exquisite late dessert plum of the greengage type, extensively planted as a late market sort. Tree very vigorous, very productive. Branches smooth. Fruit large, roundish, a little flattened ; greenish-yellow, with splashes of green, thin bloom ; flesh yellow, juicy, sugary, melting, rich, excellent, separates from the stone.

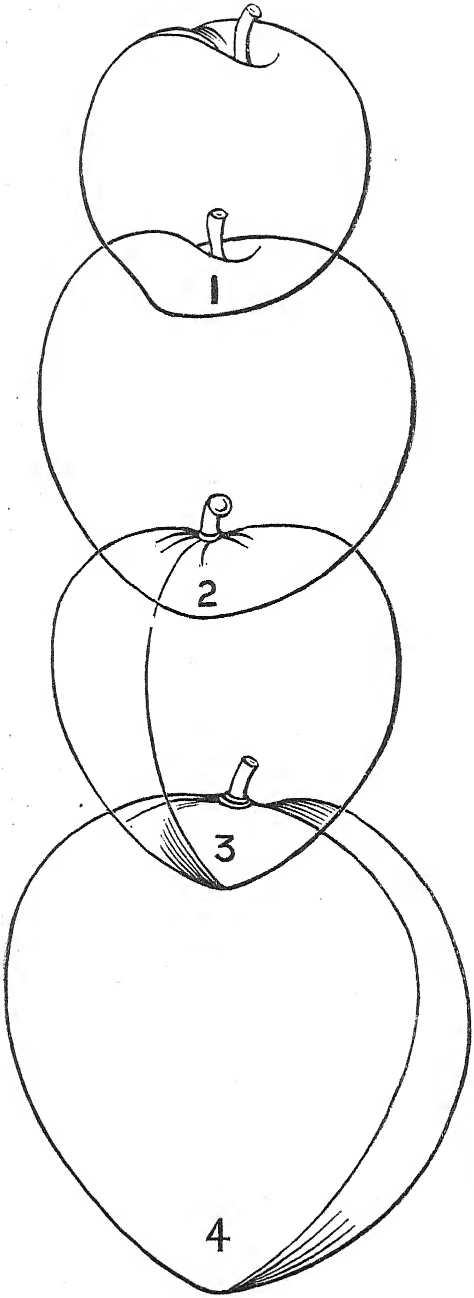
Yellow Magnum Bonum, Fig. 6 (syn. Egg Plum. English), L., K.—Popular on account of its large and splendid appearance, and a slight acidity, which renders it admirably fitted for making showy sweetmeats or preserves. When raised in a fine warm situation, and is fully matured, it is pretty well flavoured, otherwise it is coarse. Branches smooth, long, a pretty good bearer, though apt, in light soils, to drop from the tree before becoming matured. Fruit very large, oval, narrow at ends, necked at base, suture distinct; stalk one inch, not sunk, surrounded by fleshy ring at insertion ; light yellow, bloom thin, white ; flesh firm, rather acid until fully ripe, and then sweet, adheres to the pointed stone. Ripens in February.

Washington (Fig. 7), M.—Although not equal to the greengage and two or three others in high flavour, yet its great size, its beauty, and the vigour and hardiness of the tree, are qualities which have brought it into notice everywhere. Tree remarkably large, broad, and glossy foliage ; is a strong grower, productive, and forms a handsome round head ; wood light, brown, downy. Fruit very large, roundish oval, suture obscure, distinct at base ; yellowish-green, faintly marbled, often with pale red blush ; stalk half to three-fourths inch ; slightly downy, cavity wide, shallow ; flesh rather firm, sweet, mild, very rich, and luscious, free from the pointed stone ; shoots downy ; ripens end of January.

Tragedy (Fig. 8), E.—The earliest Californian prune. Ripens towards the middle of January. Tree a rapid grower of symmetrical form. Fruit large, oblong, dark purple skin covered with heavy blue bloom ; flesh yellowish-green, rich, and sweet, being so as soon as it begins to colour into ripeness.

Damson, E.—Cultivated for cooking purposes. There are several varieties of this fruit all originating from the native English plum. Amongst the best is Crittenden's Cluster, or Prolific. Fruit larger than any of the others, roundish oval, skin black, and covered with a thin bloom. Tree a heavy bearer. Young shoots downy.

Prunus Simoni (Apricot Plum), E.—A native of China ; tree small, thrifty and vigorous, bearing when quite young. Fruit hanging on the trees shining like apples of gold, becoming a rich vermilion when fully ripe. Large, flattened, tomato-shaped, with deep cavities at base and apex; brick red or dark cinnabar colour ; stem very short, flesh fine, apricot yellow, with peculiar aromatic pineapple and faint banana flavours. Leaves large, long, oval, elliptic, of dark shining green ; flowers small, white ; reaches its perfection in hot, dry summer air and on good moist soil. Light green branches of Simoni grow as vigorous and upright as the Bartlett Pear, and are heavily clothed with unusually long, narrow, light green leaves. Valuable only as an early plum ; carries fairly well.



Japanese Plums.

(*Prunus triflora.*)

The names so commonly applied to Japanese plums as Botan, Satsuma, Hattankio, etc., really refer to districts or to classes, thus: Satsuma originates from the island of that name; Hattankio is called after "hatan," an almond, which this large oval-pointed plum resembles. Many hybrids have been raised and named in California; none of these plums make a large tree on their own stocks; they grow larger on peach. The best of these, in the order they ripen, are:

Red June (syn. Shiro-Smomo) E. Fig. 1.—Ripens first. Tree of spreading habit, foliage dull, fruit deep crimson all over while still firm; shaped much like a small Kelsey, that is, with very marked and lengthened apex. A sure cropper.

Botan or Abundance, E.—Glossy foliage and inclined to grow upright. Fruit roundish with very little point and gets dull red on one side. Ripens a week after Red June is gone, and gets soft very soon after ripe. A strong grower.

Burbank, E., Fig. 2.—Tree, imported from Japan, vigorous, with

strong upright shoots, and large, rather broad leaves; comes into bearing very early. Fruit almost globular, large, rich cherry red, slightly mottled with yellow, and freely dotted with same tint. Flesh, deep yellow, juicy, very sweet, and of fine, somewhat peculiar but agreeable flavour; pit very small. Very productive. Ripens beginning of March.

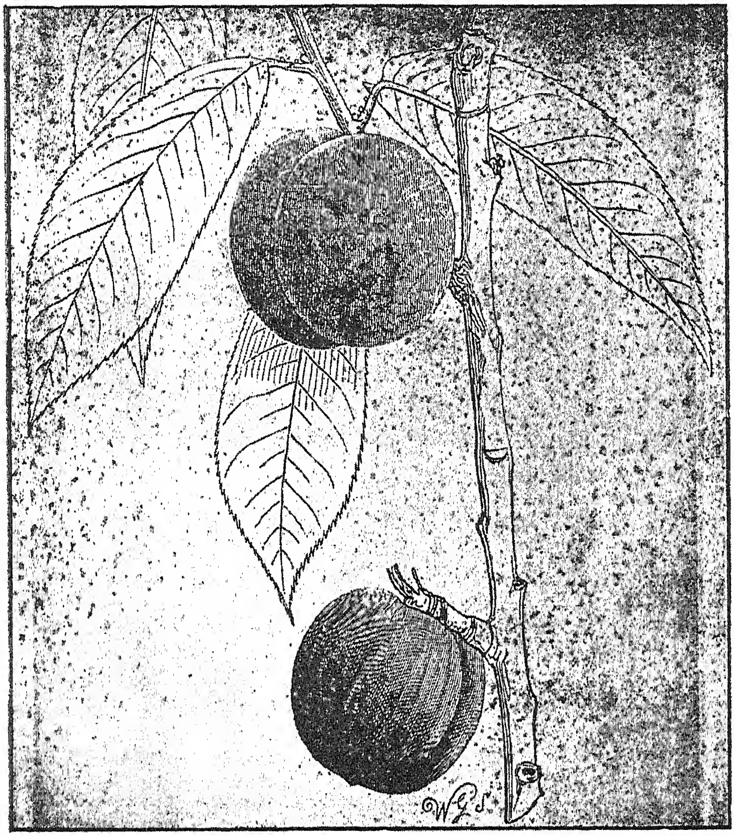
WICKSON, L., Fig. 3.—A cross between Burbank and Kelsey. A valuable market plum, its time of ripening being late when the glut of peaches and other plums is over. Shape somewhat similar to Kelsey, but more symmetrical. Colour cherry red to claret. Flesh amber, pit small. Is picked before it colours up, and on keeping develops an intense carmine.

KELSEY (syn. Hattankio), L. Fig. 4.—Tree upright in growth, having a tendency to long slender branches, which should be frequently pinched back; leaves narrow, twigs brownish grey. Very productive and apt to break down. Fruit large, from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches diameter, heart-shaped, with a distinct suture on one side from stem to apex; stem is short and set in a depression at the large end; colour, mixed yellow and purple, which vary in depth, but rarely make a brilliant appearance, covered with a bloom; flesh yellow, very firm, and clings to the stone, which is rather small, and nearly always partly surrounded by a cavity; when fully ripe the quality is very good. In California the tree resists drought remarkably; it is almost an evergreen, liable to injury in severe climates; comes into bearing as young as the peach; requiring same pruning, ripens late. Likes heavy, moist land when planted in proximity with other sorts, such as Satsuma, the blossoms set better. Ripens end of March. Likely to prove a profitable market and shipping variety.

SATSUMA BLOOD (syn. Yone-momo), L.—Leaves more lanceolate than those of Kelsey; fruit averages about $2\frac{1}{4}$ inches in diameter, nearly round, and but slightly sutured on one side; colour dark red under a thick bloom; dots rather conspicuous and numerous; flesh dark purplish red (blood colour), firm, stone very small and pointed. Ripens earlier than the Kelsey. Keeps well, and will not spoil for weeks after it is ripe; can be left hanging on the tree for three or four weeks after it gets deep red.

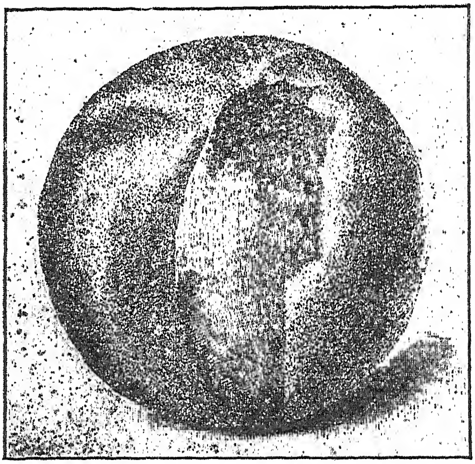
TWO KINDS OF FRUIT ON THE SAME TREE.

Mr. J. H. Maiden, Curator of the Botanical Gardens, Sydney, writing to the *Gardeners' Chronicle* on the existence of peaches and nectarines growing on one tree, quoted the following extracts taken from Smith's *Selections from the Correspondence of Linnæus, etc.*:—"Lord Wilmington has another instance of this commixture or blending of fruits, for he has a tree that produces nectarines and peaches, without any art, but quite accidentally. The fruit does not mix together, as in the apple abovesaid; but complete peaches and nectarines both distinct on the same tree." (P. 7, Peter Collinson to Linnæus, April 3, 1741.)



A Peach on the Upper and a Nectarine upon the Lower part of the same Branch.

"Some time ago I saw what I think a surprising curiosity. On a large peach tree, full of fruit, there was a twig about two inches long; on one side grew a peach, and on the other side a nectarine. They grew so close together that they touched each other. I stood long with admiration viewing this wonder. The nectarine had the shining smooth surface, with a red complexion; the peaches rough and downy, as peaches are. We have had two more remarkable instances of peach trees naturally, and without art, producing nectarines; so I reasonably conclude the peach is the mother of the nectarine. Where this *lusus naturæ* has happened, ingenious men have improved the accident by budding, or with grafting with the nectarine branch; and thus the race of nectarines began. The variety we have in our gardens has been produced by sowing the stones, and I will tell my dear Baron [Linnæus] an instance in my garden. Some person eating a



A Composite Fruit: part Peach, part Nectarine.

nectarine threw the stone away. Next year it came up. I suffered it to grow, supposing it to be a peach; but as it grew up to the fifth year, to my great pleasure it showed it to be a nectarine—and this year at the present writing, has near three dozen of ripe fruit on it, as rich and high flavoured as those against the wall. Dr. Solander came down to Mill Hill to feast himself with nectarines, and he saw this fine tree full of fruit, which ripens a week or two later than those against the wall. This accident confirms what many doubted, that a nectarine can be produced from the stone, without grafting or budding." (P. 70, Peter Collinson to Linnæus. September 25, 1766.)

"Of this several instances have since appeared; but the editor had once a present of a much more curious variety—a fruit precisely

half nectarine, half peach, the size, colour, surface, and flavour of each being perfectly distinct in the respective halves. This was witnessed by several persons. It grew in the garden of the late J. Aufrere, Esq., at Hoveton, Norfolk, on a tree which usually bore some complete nectarines as well as peaches; but in two different seasons, at some years distant from each other, the same tree produced about half-a-dozen of the combined fruits." (P. 8, Editorial Note, 1821, by Sir J. E. Smith.)

THE CULTIVATION OF MAIZE.

By Percy G. Wicken.

The growing of maize is an industry that is much neglected in this State, and as plenty of suitable soil is to be found in the South-Western districts it would be well worth the while of some of our agriculturists in this district to turn their attention to the cultivation of maize. Several experiments with a number of varieties have been carried out at the departmental experimental plots at Hamel, and the results have turned out very satisfactorily. Some fine samples of maize have been produced, which would compare favourably with that grown in the other States. Apart from the question of raising maize for grain, the business of growing maize as fodder for the stock should be largely entered into. Maize is about the best all-round green fodder for dairy cattle that can be obtained, it is a splendid fodder for milk producing, and can be used either in its green stage or for making ensilage. Several good crops of maize have been raised in the South-West during the past season and cut for green feed, and have given very satisfactory returns.

Our statistical returns show that during the past year the acreage under maize was 530 acres, yielding 5,611 bushels, or an average of 10·59 bushels per acre. Apart from the very small area under cultivation, the average yield is very low, and shows that the crop must either have been sown on very unsuitable soil, or that it has not received proper treatment during the growing season.

It may not be known to many that the total maize crop of the world is greater than the total wheat crop. The total yield of the world being:

Maize	... ...	2,735,090,000 bushels
Wheat	... ...	2,586,025,000 „

Of this enormous total, the greatest part, viz., 2,078,144,000 bushels, is raised in the United States of America, and there forms the main crop of the majority of the farmers, especially in the Southern States. It seems to be grown in all the States from one end of America to the other, and the average yield of all the States is given as 25·3 bushels, and the average price realised 35·7 cents per bushel (equal to about 1s. 6d.).

Of the balance, Europe is the next largest producer, followed by South America, Africa, and lastly by Australasia, which contributes 10,025,000 bushels towards the total. Of the Australian total the bulk is contributed by New South Wales and Queensland, Western Australia bringing up the rear with 5,611 bushels, and an average of 10·59 bushels.

Soil.—The most suitable soil for producing heavy yields of maize are river flats or rich swamps which keep fairly moist during the summer weather; on such lands yields of over 100 bushels per acre are not uncommon. On the other hand, maize grows over a very wide range of country, and in the Eastern States I have seen it growing equally well along the sea coast and also 5,000 feet above sea level in the mountain ranges. It is a crop that likes heat, but likes moisture too, and where both are to be obtained the crop grows to perfection. In districts where the rainfall is only moderate during the summer much may be done by constant cultivation, and in a series of experiments carried out a short time ago by the writer it was proved that each extra time the cultivators were run through the crop the yield was increased by several bushels per acre. The following table gives the actual results. The cultivations refer to that given after the crop was above the ground:—

	bushels.	lbs.	
Uncultivated	41	20	per acre
Cultivated once	47	30	,,
,, twice	48	20	,,
,, three times ...	50	21	,,
,, four times ...	52	2	,,

This cultivation should take place from the time the crop is above the ground until the cob is well formed.

The system of cultivating maize is as follows:—The ground requires to be deeply ploughed and well worked up until a fine tilth is obtained, drills are then struck out from three feet to five feet apart, according to the strength of the soil and the variety of maize to be sown.

There are two methods of sowing practised: One is to plough out drills in both directions and to sow four or five seeds, and the manure at the intersection of each drill; this system enables the crop to be cultivated in both directions. The other is to strike out drills one way only, and to sow the seed about 16 inches in the drill; this method is estimated to give the heaviest yield, but only allows the crop to be cultivated in the one direction.

Where only a small area has to be sown, and the work is to be performed by hand, both systems take about the same amount of labour; but where a large area has to be sown the system of sowing 16 inches apart in the rows is by far the most profitable, as most of the work can be done by machinery.

Figure 1 is an illustration of a machine which opens the furrow, plants the corn, and covers it up again in one operation. This machine, with one horse and a man, will plant a large area of maize in a day.

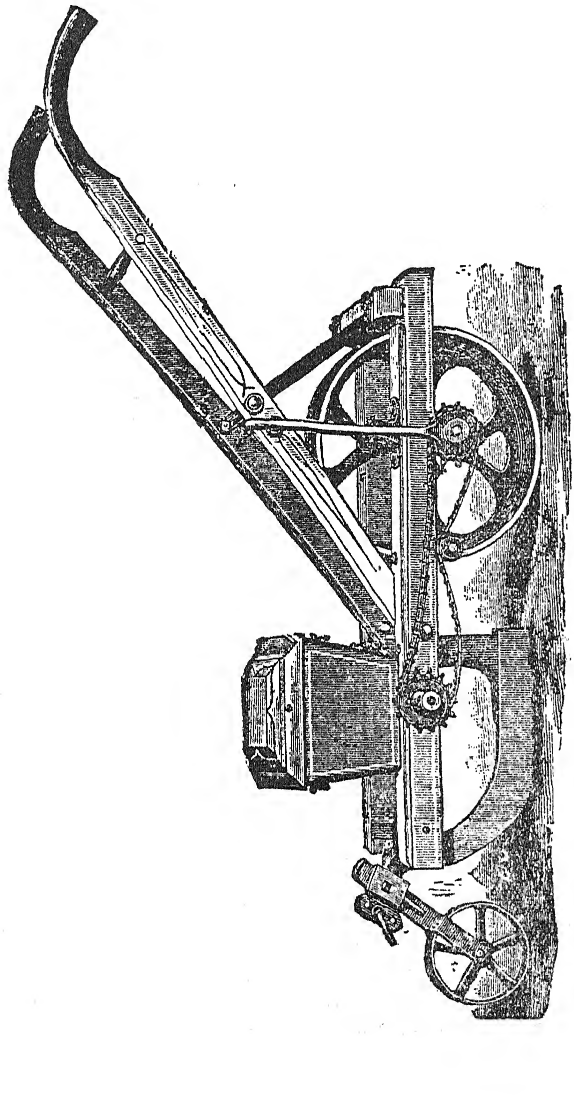


FIG. 1.—This machine opens the furrow, plants the corn, and covers it at one operation.

Figure 2 shows a similar machine with a fertiliser attachment, by means of which the seed and manure is sown in one operation.

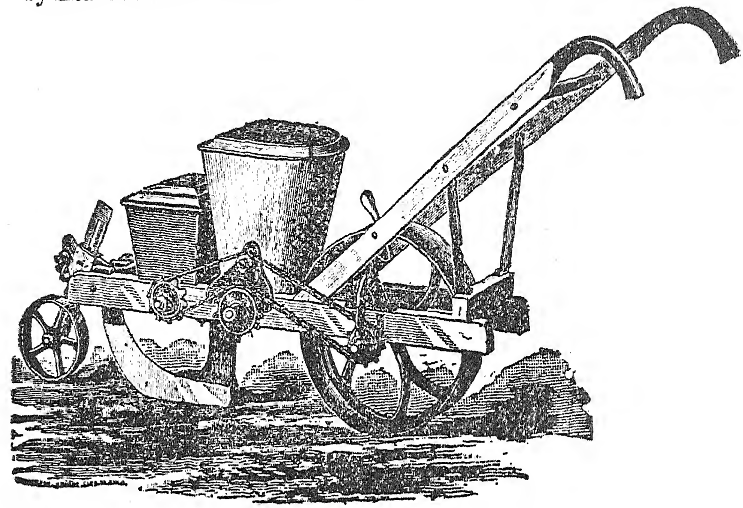
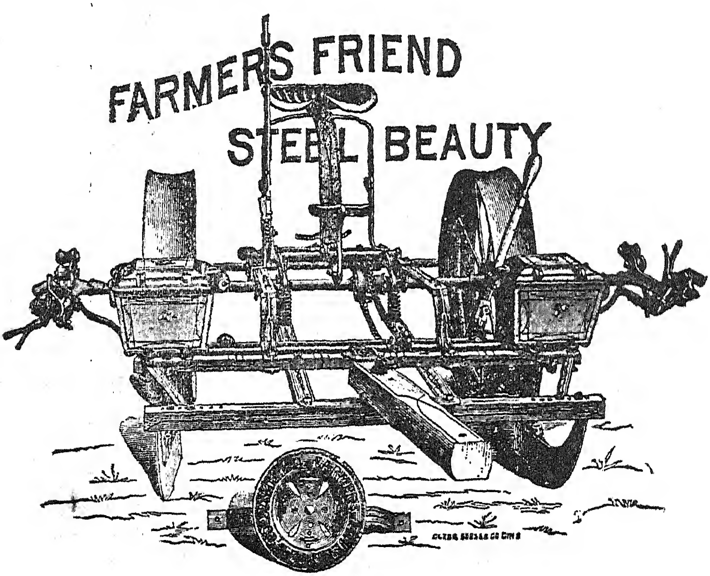


FIG. 2.—This fertiliser attachment can be attached or detached in a few moments, and will fit the above machine.

Figure 3 is an illustration of a very useful machine, the Farmer's Friend Steel Beauty, which will sow maize, sorghums,



peas, beans, and almost all kinds of seeds. It requires two horses, and opens out, sows, and fills in two drills at a time, and also marks out the drill for the next turn. I have found this machine of great service in general farm work, it will get over a large area of ground in a day, and does its work in a very satisfactory manner.

An attachment is also made which can be attached to an ordinary wooden beam plough, which drops the seed in the furrow behind the plough; the seed is then harrowed in.

As soon as the maize appears a few inches above the ground it should be well harrowed. This can be continued at intervals until the maize is over 1ft. in height. This will kill most of the young weeds as soon as they appear, and will not in any way injure the maize crop. After the maize becomes too high for the harrows the cultivation is best performed by means of the Advance Disc Corn Cultivator, or hilling disc, as it is sometimes called. An illustration of this machine is shown in Figure 4. The machine consists of four

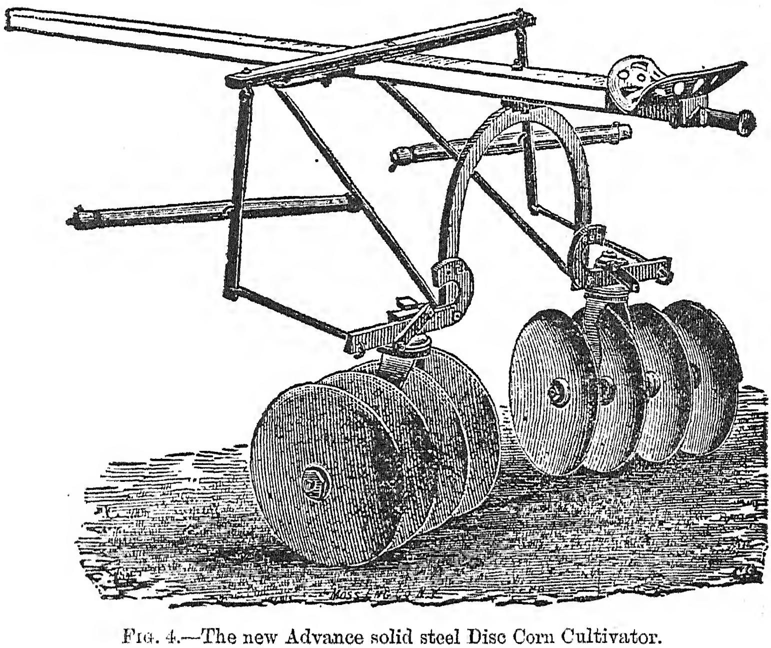


Fig. 4.—The new Advance solid steel Disc Corn Cultivator.

steel discs on each side of a central beam, and the disc can be set at the angle required to hill the maize either in one operation or by throwing a smaller quantity of earth each time it is cultivated as required. The disc can also be reversed so as to throw the earth away from the rows, should it be desirable to do so. The machine is drawn by two horses, one of which walks on each side of the drill, the maize passing under the arch in the centre of the machine. In

the event of this machine not being available, the operation of hilling can also be performed by means of the Planet Junior Horse-hoe, which has side ploughs attached to make it suitable for this work. The illustration in Figure 5 shows the maize being cultivated by this method. After the maize cobs have set no further cultivation is necessary. Maize being a gross feeder, requires a liberal supply of manure, and a mixture of bonedust, blood manure, and superphosphate mixed together in equal quantities will be found to give very satisfactory results. The manure should be sown at the bottom of the drill, either before or at the time of sowing the seed.

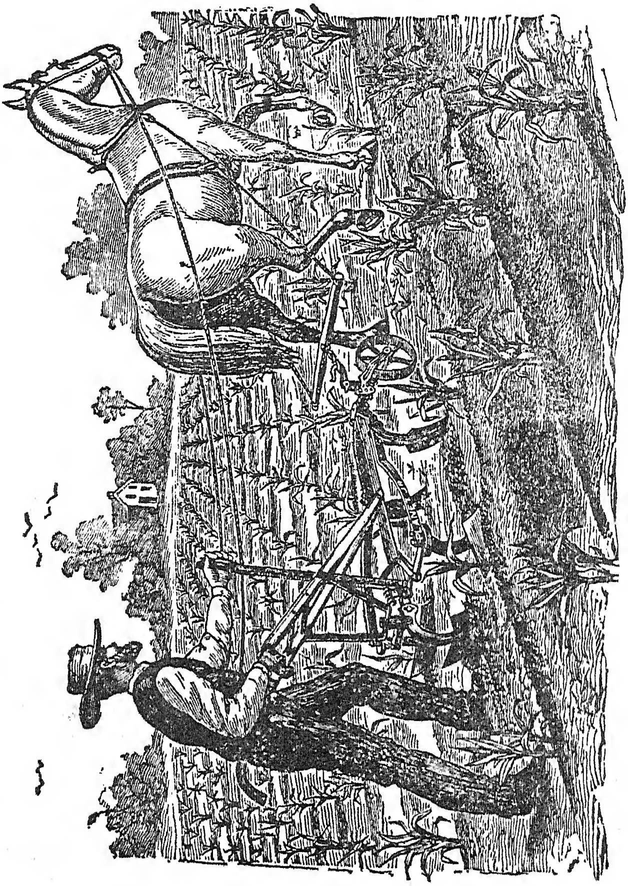


Fig. 5.—The Planet Junior Hoe at work.

The seed should be sown as soon as all danger of frost is over, and the earlier in season it can be sown the better the yield that is likely to be obtained.

The greatest trouble in maize growing is the amount of labour required in harvesting, which has mostly to be performed by hand. If grown for grain the stalks are generally left standing in the field, the cobs being pulled by hand and carted into the barn, and kept until required, when they are husked by hand and shelled by machinery. In maize growing districts this work is the general occupation for wet days,

In the United States of America, where maize growing is undertaken on a large scale, they have machines which cut the corn stalks and tie them into bundles, the same as the reaper and binder does wheat. The sheaves are then stacked in the field until dry, and then carted in and put through a machine which pulls off the cobs, and tears the stalks into shreds, which are then used for feeding stock or stored away until required. The same harvesting machine is of great advantage in cutting down green maize or sorghum stalks for the purpose of making ensilage.

Care must be taken that the maize cobs are thoroughly dry before being stored away, otherwise they soon become mouldy and are useless. There are several varieties of machines in use for the purpose of shelling the maize from the cob, some being small machines to be worked by hand and some large machines worked by steam power, which are capable of putting through a large quantity of maize per hour.

The latest machines where the crop is grown for fodder only are those which shred up the whole stalk, cob, husk, and all into one mass, which is found to make an excellent stock feed.

According to the American reports the analysis of the pith of the maize cob, when ground up, is very similar to that of wheaten bran, and machines are now made which grind up the whole cob, pith, and all into one mass, the whole of which is consumed by the horses. This does away with a great quantity of waste, as the pith of the cobs is generally burnt, and also saves the expenditure for bran. This method was practised at Hawkesbury Agricultural College, New South Wales, with very satisfactory results.

There are a great number of varieties of maize under cultivation, including yellow, red, and white varieties, also pop maize, sweet maizes, etc. The earliest variety giving any good result is the ninety-day maize. This is a small grain and rather hard, and is only grown on account of its early habits.

The Golden King, Golden Surprise, and Yellow Hogan are perhaps the best varieties for market.

Of the American varieties, the Early Mastodon, Leaming, and Gold Mine are all good varieties, and ripen early.

The white varieties most in favour are the Hickory King, Iowa, Silver Mine, and the American White Meal Maize.

This Department has recently imported and distributed to settlers a quantity of a very large white maize which grows to perfection in Cuxco in Peru. It is the largest grain I have ever

seen, but is light in weight. It is said to grow to from 20ft. to 25ft. high, and to yield very heavy crops. It also grows at 8,000ft. above sea level. We shall have an opportunity to see, during the coming season, what success we have with it in this State.

The cultivation of maize can be very profitably taken in hand wherever a crop of pumpkins is grown. The two crops go well hand in hand. They grow well in the same localities and in the same class of soil. A few rows of maize between each row of pumpkins helps to increase the returns from every acre, and also utilises land which would otherwise have to be left idle. In nearly all the maize-growing districts this crop is grown in conjunction with a crop of pumpkins. There are several different ways in which they can be grown, the quantity and distance apart depending on whether maize or pumpkins is to be the main crop.

A crop of maize in which the cobs only are harvested and the stalks cut down and returned to the soil is the means of adding a good supply of humus to the soil. This may be further increased with much benefit to the farmer by sowing a row of cow peas between each row of maize. After the corn is hilled, the peas can be sown in the centre between each row. By the time the maize stalks are fit to plough in, the cow peas will have made a good growth, and when ploughed in will add to the soil a large quantity of leguminous matter containing a quantity of the most valuable fertilising matter, viz., nitrogen.

SEEDLING ORANGES.

Recently Mr. Samuel Jupp, of Narra Tarra, sent to the Department of Agriculture for examination samples of seedling oranges grown by him. They were submitted to Mr. Despeissis, who reported as follows:—"Fruit medium size, round, and somewhat flattened; rind thin, fairly easily peeled; seeds few (two to four), and most of the segments seedless; ripens late (Narra Tarra is fully a fortnight ahead of the Swan); tree a strong grower, thorny; this last character is the only undesirable one. I would like to point out that a strong evidence of the particular suitability of Western Australian climatic conditions for trees of the citrus family is found in the fact that seedlings grown under favourable circumstances generally show an improvement on the parent stock; thus the flavour greatly improves and the number of seeds decreases. This seedling is a case in point; and I would likewise enumerate other samples, such as the 'Cheriton,' or Gingin oranges; the Lawnswood seedling (Clackline); the old Narrogin Inn mandarins (Armadale); the Cardup seedlings, etc."

BEE NOTES.

By J. Sutton.

Notes published in August number of the Journal cover almost all the work necessary for September, except that, during a cold spell in the weather, it may be almost imperative to feed any colony that is short of stores, this should be given in the evening, and should be as thin as it is possible to make it, if it can be made the same consistency as the nectar the bees gather, all the better.

Every fine, warm day the bee-keeper should overhaul his stocks, that he may know how each is keeping, and be able to supply the needs of any or every hive.

Some may need no attention at all, while others may require a Queen, or a little brood from its neighbour; without this attention, when honey is procurable, stocks may be too weak to take advantage of the harvest.

Always be careful, after examining hives, to see that the cover is placed securely in its place, so as to preserve the heat of the hive during cold nights.

Where hives have not already had attention with the paint brush, now is the best time to do this work, which can be done without in any way disturbing the inmates; bottom boards should be examined, and all refuse removed. I make it a practice to remove and paint the bottom boards of my hives twice during each year (at the end and beginning of each season).

Where there is any trouble with the "White Ant," if the bottom is scraped clean from all wax or other refuse, as propolis, then give a coat of "Avenarius," allowing this to get thoroughly dry before returning to the hives; it will be found very effective against these pests.

Those who only produce extracted honey should now put on "Honey Boards," unless care has been taken to have only worker comb, both in the brood nest and also in the super. For comb production this precaution is perhaps not so much needed, but for extracted, brood in the super is not productive to a good and clean sample of marketable honey, except in some few cases. It always pays best to use full sheets of foundation, thus keeping in check a superabundance of drone comb. Where honey is the object, keep your colonies strong. Don't be tempted to reduce the store of honey, except you are certain that your bees can replace it at once. If some have an abundance, distribute to the weaker hives.

AGRICULTURAL PRODUCE.

SPECIAL RAILWAY RATES.

His Excellency the Administrator in Executive Council has been pleased to approve of the special rates for agricultural produce grown in the State (pages 49 and 50 of the Classification and Rate Book) being cancelled, and of the following rates being substituted in lieu thereof, to operate as from 1st September, 1902 :—

Special Rates for Agricultural Produce Grown in the State (Station to Station).

For grain, flour, meal, bran, pollard, roots, potatoes, onions, pumpkins, mellons, turnips, hay, straw, chaff, green fodder, ensilage, and other agricultural produce not otherwise specified.

On the "Up" Journey only.

Traffic charged at these rates will be carried at the owner's risk only :—

75 miles and under	Class "A"		
	s.	d.	
76 to 100 miles	10	9	per ton.
101 to 125 "	11	6	"
126 to 150 "	12	3	"
151 to 175 "	13	0	"
176 to 200 "	13	9	"
201 to 225 "	14	3	"
226 to 250 "	14	9	"
251 to 275 "	15	3	"
276 to 300 "	15	9	"
301 to 325 "	16	3	"
326 to 350 "	16	9	"
351 to 375 "	17	3	"
376 to 400 "	17	9	"

Minimum, 5 tons per four-wheeled truck, and 10 tons per eight-wheeled truck, except for hay, chaff, straw, and green fodder, when the minimum will be 3 and 6 tons respectively, and for vegetables, the minimum for which will be 4 tons and 8 tons respectively. Less quantities will be charged as for truck loads or actual weight Class "B," subject to smalls minimum plus 2s. per ton when handled by the Department.

Consignments will be treated as in "up" transit when carried from any inland station to any port or in the direction of any port.

When consignments are sent in "up" and then in the "down" direction, or *vice versa*, and the united freight at the "up" and "down" rates of their respective weight minimum amounts to more than the through charges at "down" journey rates, the latter charge only will be made.

Special Rates for Agricultural Produce Grown in the State (any direction) for Distances over 300 Miles (at Owner's Risk), Station to Station.

Up to 300 miles	Class "A"		
	s.	d.	
301 to 325 miles	29	0	per ton.
326 to 350 "	29	6	"
351 to 375 "	30	0	"
376 to 400 "	30	6	"
401 to 425 "	31	0	"
426 to 450 "	31	6	"
451 to 475 "	32	0	"
476 to 500 "	32	6	"
501 to 525 "	33	0	"
526 to 550 "	33	6	"
551 to 575 "	34	0	"
576 to 600 "	34	6	"
601 to 625 "	35	0	"
626 to 650 "	35	6	"
651 to 675 "	36	0	"
676 to 700 "	36	6	"

Minimum, 5 tons per four-wheeled truck, and 10 tons per eight-wheeled truck, except for hay, straw, chaff, and green fodder, the minimum for which will be 3 tons and 6 tons respectively.

For vegetables the minimum will be 4 tons and 8 tons respectively.

Less quantities will be charged as for truck loads or actual weight Class "B," smalls minimum, plus 2s. per ton when handled by the Department.

STOCK AND STATION.

NEWS AND NOTES.

By Norman Malcolm, Inspector of Stock.

"The Stock Diseases Act, 1895," and Regulations.

Although the Stock Diseases Act has been in operation since 1895, it is surprising what a hazy acquaintance even those actively engaged in the stock trade have with its provisions. More particularly is this noticeable in connection with the import trade, and, as the Department has frequently been brought into conflict with shipping firms who may have unconsciously committed some breach of the law, my intention in supplying these notes is to state clearly the procedure they are expected to follow.

With regard to stock imported for immediate slaughter, to adequately demonstrate my meaning, we will imagine that Brown

is importing a shipment of 400 bullocks from Victoria. In the first place it will be necessary for him to have them inspected by a Victorian inspector, authorised by the Government of that State so to act, and a certificate must be obtained from him, in addition to a declaration by the owner or breeder of the stock, or the manager of the farm or station from which they come, to the effect that such stock were, at the time of departure from the farm or station, and for the preceding three months, free from disease, and had not, for the same period, been in contact with diseased animals. On shipment these documents are placed in charge of the responsible ship's officer, and, at the termination of the voyage, are handed to the principal Officer of Customs at the port of landing, together with the declaration made by the Master of the Vessel as to the condition of the stock, fodder, fittings, and effects then on board the boat. The Customs Officer then, as expeditiously as possible, forwards these papers to the nearest Inspector of Stock. If the certificate and declarations are satisfactory, and a personal inspection convinces the inspector that the stock are free from disease, he will then issue a permit for the landing of Brown's consignment, and direct him to take the bullocks to a specified place, from which they may not be removed without his permission in writing. Brown, or his representative, must see that he becomes possessed of the permit for landing, should it have been handed to the Master of the Vessel, as he may at any time be called upon by an inspector, or member of the police force, to exhibit it.

The same procedure is followed in regard to stock not intended for slaughter, excepting that the permit to land does not direct the stock to a specified place.

In the case of stock imported from beyond the limits of the Australian States and New Zealand, the animals must be accompanied by a certificate of a duly qualified veterinary surgeon, approved of by some person authorised in that behalf by the Governor, that the stock when placed on board the vessel conveying them were in a sound and healthy condition, entirely free from any disease, or any indications of it. On arrival at the port of landing the same provisions are made by the Act and Regulations as for imported interstate stock, excepting that when passed by the local inspector, and a permit has been granted for their landing, the stock are subjected to the following periods of quarantine:—

Sheep	14 days
Horses	14 days
Cattle	30 days
Camels	40 days
Pigs	30 days
Dogs	6 months
Goats, Deer, Llama, and Antelopes ...	30 days

These periods may be extended at the discretion of the inspector.

I would also particularly draw the attention of those engaged in the imported stock trade to Section 14 of the Act, which in itself is so clear that any explanations of its provisions would be super-

fluous. It reads as follows:—"*No imported stock, nor the effects of any attendant*, shall be landed or introduced into the colony until the same shall have been examined by an inspector, and a permit granted by him for the landing or introduction thereof, which the owner shall exhibit when required by an inspector or member of the police force: And no fodder put on board any vessel with or for the use of or used with any imported stock, and no fittings used for, with or about such imported stock, shall *on any account whatever* be landed or introduced into the colony."

ANNUAL REPORT.

Department of Agriculture.

The Honourable the Minister for Lands.

I have the honour to forward herewith the Annual Report of the Department of Agriculture for the year ending 30th June, 1902.

It is with much regret I have to record the death of the late Secretary of the Department of Agriculture, Mr. L. Lindley-Cowen. By his death the State has lost a good servant, and the settlers a capable and hard working friend.

Consequent on Mr. Cowen's death a re-organisation of the Department was decided on. The Agricultural Department, Stock Department, Agricultural Bank, and Rabbit Department were constituted a separate department, and, in the beginning of March, I assumed control thereof as Director of Agriculture and Manager of the Agricultural Bank. This amalgamation, it is hoped, will improve the efficiency of the departments concerned, and facilitate the transaction of their operations

The short term of my office makes it somewhat difficult for me to speak intimately of the work of the Department during the past year, and I have therefore decided to submit the reports of the various officers of the Department, with a few covering remarks on matters I think it advisable to refer to.

Offices of the Department.

The fact of the offices of the various branches of the Department being so scattered militates very much against economical and satisfactory control; and it has therefore been decided that a new suite of offices shall be erected on a site to be selected. By this means the various departments under my control, and also the Forestry and Fisheries Departments, will be under one roof, thus facilitating the administration of the Department.

Staff.

A few alterations have been made on the staff of the Department. Mr. Crawford, the Dairy Expert, has been transferred to the Lands Department as Land Agent for the Northampton District, an office in which I feel sure his well-known abilities will be used to the best possible advantage to the State.

The Chief Inspectorship of the Insect Pests Act has been transferred from the Horticultural and Viticultural Expert to Mr. G. Buchanan. This will relieve Mr. Despeissis of a good deal of detail work in connection with the Act, and will leave him more at liberty to comply with the increasing demand for his presence in various parts of the State.

A few minor alterations have been made, with the result that the staff is now, I think, a capable and efficient one.

Agricultural Advisory Board.

The gentlemen comprising this Board have continued, as in the past, to place their valuable services at the disposal of the State, much to its advantage. During the coming year I hope arrangements will be made to utilise to a greater extent the ripe experience and wide knowledge so freely placed at our disposal by the members of the Board. I much regret having to record a loss to the Board and to the State in the lamented death of the late Honourable H. Lukin, M.L.C. The vacancy so created has been filled by the appointment of Mr. Vernon Hammersley, of Newcastle.

Public Markets.

During the past year the Department has taken over the control of the Perth City Markets. The Markets are at present held under a lease which expires in August, 1902, with right of renewal for one year on mutually agreed terms. During the year extensive alterations and improvements have been made to the Markets, and it is hoped before long we may be able to make such arrangements as will ensure the Markets fulfilling, to a greater extent, their proper function—the cheapening of food supplies to the consumer.

Importation of Insect Parasites.

During the year the Department was fortunate in securing the services of Mr. G. Compere, who joined the Department as Entomologist. Mr. Compere is an ardent advocate of the introduction and distribution of their primary parasites as a means of combating insect pests, and instances, as evidence of the soundness of this theory, the great success which has attended this branch of economic entomology in California and other parts of the world. There can be no doubt that an enormous amount of good can be done by this means; and Mr. Compere is now in the Eastern States collecting parasites of various pests. One of the most serious pests we have to contend with is the "Fruit Fly"; and it is proposed to

shortly send Mr. Compere to Italy to see if he can procure its parasite. Should he be able to do so it will mean a saving of thousands of pounds to this State in years to come. This matter is dealt with more fully in the attached report of the Horticultural and Viticultural Expert.

Noxious Weed Act.

A good deal of work has been done, and a considerable amount of money spent, in endeavouring to cope with the "Stinkwort," but I am regretfully forced to the conclusion that the task is a hopeless one, unless the Government is prepared to spend a good many thousands of pounds on it. During the past year some 1,200 holdings have been reported on, and the greater number cleared; but I regret to say that many settlers show themselves very indifferent, if not hostile, to the provisions of the Act. The Act itself is cumbersome and costly to administer, and the question of its amendment is now receiving consideration.

Financial.

From the balance sheet attached it will be seen that the total expenditure was as follows:—

	£	s.	d.
Salaries	£6,407	4	9
Contingencies	5,748	0	9
	12,155	5	6
Less revenue	6,434	16	8
Leaving an apparent net expenditure of ...	£5,720	8	10

Of this sum, however, at least £700 goes back into revenue through the Railway and Postal Departments, leaving an actual net expenditure of approximately £5,000, not by any means a large expenditure when the enormous interests involved are considered.

Grants to Societies.

During the year arrangements have been made to place the amount granted for the subsidising of agricultural and kindred societies under the control of this department, and regulations are now being drawn up to ensure the distribution of the grant on a more equitable basis than heretofore.

Producers' Conference.

On the score of economy it was decided not to hold a conference during the past year, but the delegates to the National Show, who were granted free railway passes by this department, held a conference in conjunction with the Chamber of Manufacturers, the proceedings of which will be found in the March issue of the *Journal*.

During the coming year it is proposed to resume the Annual Conference of Producers; but it will be strictly a business function, the picnics and excursions which have formed part of the proceed-

ings of previous conferences being dispensed with. This will be a departure that I feel sure will meet with quite as much approval from the delegates themselves as from the general public.

The following detailed reports have been handed to me by the officers of this department, and are attached hereto:—

Horticultural and Viticultural Expert.

The work in this branch is necessarily increasing every year, and continual applications are being received for the expert's services from the various fruit and vine growing districts of the State.

As it is a matter of physical impossibility for the expert to be in more than one place at once, in order to meet the growing demand for his advice and assistance it has been decided to publish a second edition of the *Handbook of Horticulture and Viticulture*, the first edition of which has long since been exhausted. This work Mr. Despeissis is now engaged on, and it is hoped the publication will shortly be available for the use of growers.

Much good work has been done by lectures, demonstrations in pruning, etc., and a very appreciable improvement is now noticeable in this latter respect.

The expansion of the wine and fruit growing industries are fully dealt with in the expert's report, and the figures there given tend to show that satisfactory progress is being maintained.

Field Officer.

Much good work has been done by this officer in lecturing, conducting experimental work, organising the National Show, etc. The new experimental farm is well under way, and should soon prove a source of useful information to the settlers. The second National Show passed off most successfully, and reflects most creditably on the organisation, which was entirely in the hands of the above officer.

Government Refrigerating Works.

The transactions of the Government Refrigerating Works for the year show a deficit of £484 15s. 8d., accounted for chiefly by a large expenditure on alterations and repairs.

As you will see, the stores have not been availed of to their fullest extent, owing to the difficulty of access to the rooms upstairs. The installation of the new lift will, however, remedy this, and, barring any untoward circumstances, the works should show a profit this coming year.

Botanist.

Advantage has been taken by the Government Botanist of the various exploration parties that have been sent out during the past year, and many interesting specimens of the flora of the State have

been collected. There is a large field for work of a useful nature in connection with this science in Western Australia, and during the coming year it is hoped the Botanist will be able to go further afield for the purpose of collecting and classifying the unknown flora of the State. The need for presses and other essentials will also, it is hoped, be provided for this year.

Specimens of poison plants have been sent to the Imperial Institute, London, whose chemical staff are analysing and investigating their properties. The result of these investigations should be of much value.

Chief Inspector, Insect Pests Act.

This officer calls attention to the increasing work under the Insects Pests Act, consequent on the extended area under cultivation. Every year adds to the difficulty in examining and treating our orchards and vineyards; and no effort should be spared to keep down and eradicate the many pests which infest them while the trees are comparatively young and small.

The extermination of the San Jose, fruit fly, and other pests are ably dealt with, and the remarks made are worthy of careful consideration, particularly those in connection with the "second-hand" fruit case.

The Chief Inspector also deals clearly and thoroughly with the question of imported fruits, etc., and concludes with an appeal for more inspectors, which it is much to be hoped will receive careful consideration.

Librarian and Sub-Editor of Journal.

It is satisfactory to note that the circulation of the Journal is slowly, but surely, increasing; but still the circulation is nothing like what it should be. The Journal ought to be taken by every farmer and fruitgrower throughout the State.

The Library is increasing in Volume and usefulness, but there are still many additional books required. When these are received, and the indexing completed, we shall have a most useful source of information on agronomic subjects.

Poultry Expert.

In connection with the poultry industry there is anything but a satisfactory state of affairs to record. Sixty thousand pounds' worth of eggs imported into this State in one year, and the importation increasing. It would pay this State handsomely to get a thoroughly reliable man to do nothing else but tour the country and teach people how to keep fowls. Efforts have been made to cope with the lack of knowledge, but, with the limited staff at our disposal, it has not been possible to do much. A small poultry farm has been started at Narrogin, for the purpose of supplying eggs, true to name, and this is being largely availed of, showing a disposition

to go in for the industry if only some encouragement to do so is given.

Bee keeping.

Progress is being made in this branch, but not to the extent it should be. With its magnificent native flora, Western Australia should be in the van of the honey producing States of the Commonwealth. It is to be hoped this important and remunerative branch will receive more attention in the future.

Conclusion.

In conclusion, I have to thank those Departments in the Eastern States, and other parts of the world, for the kindly assistance so generously placed at our disposal by their larger and more complete staffs; to thank the officers of the Departments under my control for their loyal efforts to carry out my wishes; to express the hope that the immediate future will see that development in matters agronomic that our enormous potentialities give us a right to expect; and that Government, Parliament, and people will unite to bring about this "consummation so devoutly to be wished for."

W. PATERSON,
Director of Agriculture.

Annual Report of the Horticultural and Viticultural Expert.

The Director,—For the information of the Honourable the Minister, I beg to report on the work done in connection with my branch of the Department during the 12 months ending 30th June last.

Office Work.

Much time is necessarily taken up interviewing visitors, and dealing with correspondence and other matters bearing on Horticulture. These matters extend, and more time is thus absorbed, as settlement increases.

Samples of soils, fertilisers, chemicals used for combatting pests of orchard and other cultivated crops are also submitted, and fruit, wine, and manufactured products of the orchard and vineyard are tested, identified and reported upon. Entomological specimens and also specimens of vegetal pathology are also examined and advice given for their suppression, or referred to specialists whenever a doubt occurs.

Seasonable articles bearing on Horticultural questions have been written and published in the monthly Journal of the Depart-

ment, and whenever possible these papers and articles have been illustrated from original diagrams and photographs.

New Edition of the Handbook of Horticulture and Viticulture.

During the year authority has been given for the republication of the Handbook which was published in 1895 by authority of the then Bureau of Agriculture.

That the publication was well received is evidenced by the numerous inquiries that have been made for it by settlers in this as well as the adjoining States.

In the present edition, which now stands partly printed, care has been taken to bring up to date the information collated and condensed in conveniently arranged chapters.

Numerous wood cuts and blocks, which have from time to time been prepared for the illustration of the subject matter dealt with, will greatly aid in enabling fruitgrowers to readily recognise orchard pests, and clearly grasp methods of training and handling trees or fruit crops.

The progress of this publication has been greatly hampered by numerous calls and visits to the country. The pruning and the planting season is, however, well near over, and I anticipate being able to devote more attention to this work, which I am anxious to bring out within the next couple of months or so.

Field Work.

During the year visits have been paid to agricultural centres for the purpose of giving demonstrations in planting, pruning, grafting, and other operations carried on in the orchard from time to time. These methods have, of late, been considerably improved all through the State, with the result that the returns from our fruit crops have correspondingly increased. This circumstance has led to the lowering of the price of fruit and a corresponding increase in its consumption, fruit taking up its place more and more every year in the daily diet of the population.

Annual pruning contests have now come to stay in several of the more active fruit-growing centres, and afford a valuable means of educating orchardists in the art of training and pruning their vines and fruit trees. Skilled pruners, who, a few years ago, were very scarce in the country, are now met with in pretty well every fruit-growing district.

Whilst out amongst growers, I have also taken opportunities—after the day's work was over—of disseminating information on horticultural matters by addressing them in the evening in local agricultural halls, and illustrating my remarks by means of specially-prepared lantern slides.

Expansion of Fruit growing and Wine making.

The measure of the expansion of fruit growing may be given by referring to the importation of fruit trees into Western Australia. During the year 108,119 fruit trees—irrespective of small fruits and grape vines—were imported, showing an increase as compared with the year 1900-01 of 14,141 trees. As the number of trees planted to the acre may on an average be put down at 100, it is thus seen that sufficient trees for planting 1,081 acres were imported during the year. To this number must be added the number of fruit trees raised and sold direct from our local nurseries, which is considerable when our sparse population is taken into account.

The acreage under fruit trees and vines, according to the Registrar General's figures, amounted last summer to 9,901 acres (an increase of 1,280 acres over 1901), of which fruit trees accounted for 6,177 acres, and vines 3,724 acres. Besides this acreage 2,721 acres of land were under vegetables, including potatoes and onions. That acreage has since been greatly added to during the current planting season; and the actual extent of our orchards and vineyards may well be estimated at the present moment close on 12,000 acres. Of the trees planted, apples, pears, oranges, and eating grapes meet with special favour; and at the present rate of planting the demand of the local market must soon be met from local sources.

The total number of cases of fruit imported during the year 1901-1902 was 93,255 cases, of which tropical fruit, such as bananas and pine-apples and off-season citrus fruit, consisted of 52,902 cases, leaving for other fruit we now produce in the State 40,248 cases, equivalent to 803 tons.

Material improvement continues to take place in the manufacture of West Australian wine.

The 1901 vintage which amounted to 130,400 gallons showed an increase over the previous season's vintage of 43,600 gallons. The figures for the 1902 vintage have not yet been compiled by the Government Statistician, but the increase over the preceding year can well be calculated at about 45,000 gallons, bringing the amount of 1902 vintage to something like 175,000 gallons of wine.

Wine fermentation, which in warm climates is always attended with risks and dangers, is now better understood by our wine makers. The bulk of the grapes are picked earlier and, for that reason, yield a lighter wine. Scrupulous cleanliness is observed in preparing the fermenting and storing vessels, and the slow but disastrous action of ferments of maladies of the wine is better understood, and proper measures are taken for checking them.

Most of the vine growers, whose vineyards are situated in the warmer districts, and who are within easy access of a railway station, have availed themselves of the facilities offered them by this Department for procuring sufficient ice to enable them to efficiently control the rise of temperature to a dangerous point

within the fermenting vats. On application to this Department, the manager of the Government Refrigerating Works has been instructed to supply, as required, to wine makers 2cwt. blocks of ice at a price which covered cost of making, packing, and carting to the railway station. Thus many thousands of gallons of wine, which must without a doubt have been irretrievably spoilt, were made into sound and wholesome wine, which will help to keep up the reputation which the wine of Western Australia is making for itself.

The following table from the Collector of Customs' report shows that Western Australia, with a population that increases at the rate of about twenty thousand people every year, is becoming gradually more dependent on her own vineyards for meeting the local demand in still wine.

	1900.		1901.	
	Gals.	Value.	Gals.	Value.
		£		£
British and Foreign still wine	33,972	12,033	30,915	11,022
Australasian	23,454	9,700	22,567	9,567
Total	5,7426	21,733	53,482	20,589

With the view of diffusing amongst wine growers sound and practical ideas about wine making, I propose to demonstrate next vintage, the methods of fermentation by means of a travelling outfit, which, at specified times would be taken to the more important vine growing centres. Arrangements will be made for procuring sufficient grapes to fill a small vat capable of fermenting 100 gallons of wine or thereabouts. The progress of fermentation will be explained, watched, and controlled, with the view of making a sound marketable wine.

I am also expecting from France sets of tools for bench grafting grape vines; and these I propose to take out to country centres and there demonstrate the methods of bench grafting used in uniting the vigorous phylloxera proof stock to the more delicate but marketable wine or eating grape.

Fruit Cases and Wine Casks.

Two problems confronted the fruit growers and wine makers last summer. As the season advanced, those who had been neglectful in ordering in time their fruit cases and wine casks, found them very scarce later on, and prices went up to a point hitherto unknown in this State.

Steps have been taken to obtain from the Kauri mills in New Zealand, and from the Pine saw mills on the Richmond River of New South Wales, quotations as well as samples of several of the fruit cases in use for fruit packing in Australia; but with the high

rate of freight from the Eastern States these cases must at present be expensive.

Efforts have been made to cut cases from our own timbers, and red gum, sheaoak, banksia, and a kind of tree allied to our peppermint gum or willow myrtle (*agonis juniperina*)—which grows to a great size on the Warren and the Lower Blackwood—have been tried.

We are not able to say, however, that we have yet struck a material as suitable as oregon deal for that purpose; and we may yet have to look to Sweden and to the United States of America or Canada for a cheap serviceable fruit case. This we will be able to do when we have decided on standard fruit cases. This matter was discussed in the last October Journal of the department, and the advantages of the new Tasmanian apple case were then pointed out. Since then, in January of this year, a resolution was passed at an interstate conference of Ministers of Agriculture at Hobart, recommending that cases for the export of hard fruits should be of a standard size. Such a case of the capacity of a bushel and a half a bushel respectively, with outside measurements of 10in. x 15in. x 20in. and 10in. x $7\frac{7}{8}$in. x 20in., are found to be very suitable for that class of fruit. Such a case meets with favour from the Shipping Companies, and is said to save 6d. a case in freight, as compared with the older style. It measures 2,300 cubic inches inside measurement, or 82 cubic inches over the capacity of the imperial bushel. Twenty-three of these cases go to one ton—ship measurement. They can be packed crosswise, like bricks, without waste of space.

Some of our local timbers were placed in the hands of a cooper so as to test their merits for coopering work, but as yet none of those tried have proved superior or even equal to oak for turning into wine vessels.

Fighting Pests.

The question of combatting insect pests with the help of their natural enemies is one which has during the year been taken up earnestly by this Department. To California is due the credit of initiating, in a practical way, this method of ridding orchards and cultivated fields of some of the pests which prey upon them.

After consultation with the late Secretary of this Department, who was ever watchful of everything concerned with the advancement of agriculture, and always ready to adopt useful measures for dealing with agronomic problems, it was recognised that the fighting of pests by means of their own parasites would result in incalculable benefit to the farming, the fruit growing, and the pastoral industries of this State.

In Mr. G. Compere (once connected with the State Board of Horticulture of California) the Department was fortunate in securing the services of an able and enthusiastic exponent of the method now adopted.

Although a comparatively new fruit-producing country, Western Australia has already taken the lead amongst the other Australian States in initiating and systematically carrying out the methods of fruit and fruit trees inspection and disinfection, which have been adopted with considerable success ever since 1894, when the Bureau of Agriculture was first formed. Fumigation by means of hydro-cyanic acid gas has now become a practice found highly efficacious in the destruction of most fruit pests, not only at the ports of entry, but in a great many of our orchards. Now, again, it is pleasing to find that our recommendations in the direction of fighting pests on the lines referred to have met with ready approval by the head of the Department, and that work in that direction is proceeding earnestly.

After making himself acquainted with our local pests, Mr. Compere has set himself to find out which of their natural enemies would best operate their subjection. A list of our more destructive pests has been drawn up, together with one of some of their natural enemies which are elsewhere known to materially assist in checking them.

The first attack was directed against some of those whose internal parasites are found in the adjoining States, and for the past four months Mr. Compere, who is now on a collecting mission in New South Wales and Queensland, has been able to secure for us:—

Four internal parasites of the Black Scale (*Lecanium Oleæ*).

Two of the soft brown scale (*L. Hesperidum*).

Two of the cabbage aphis—one of another plant aphis, also one useful ladybird (*Cryptolæmus montrouzieri*), which preys on the mealy bugs, and has already saved from ruin the coffee planters and orange growers of Honolulu, the pineapple growers of Queensland and of the Cape of Good Hope. These mealy bugs have of late taken a strong hold in the gardens of Perth, and it is expected this useful ladybird will not only keep them in check, but also prevent them spreading to the more valuable country orchards.

Amongst other recent introductions I will also enumerate two useful species of Rhizobius which feed on black scales and its allies.

A metallic purple ladybird changing to golden colour (*Orcus lafartei*) and the pretty steel-blue ladybird (*Orcus chalybeus*), both scale eaters.

Of the aphis-feeding species we received a few specimens of *Verania lineola*, pale yellow with black stripes, and of *Platyomus lividigaster*.

Most of these internal parasites and predaceous insects were packed with great care, and have reached us in excellent order. Soon after hatching they were liberated in sheltered places well stocked with their particular kind of food. The methods of handling these

insects require particular care and attention, lest together with them some pests, as yet unknown in Western Australia, be accidentally introduced. In connection with this contingency, the following extract from one of Mr. Compere's reports shows that this work, although most promising in its effects on insect pests, is fraught with danger if entrusted to inexperienced hands and any but properly trained collectors.

Speaking of one of the districts he visited, he said, "There are thousands of citrus trees growing wild along the river, and so thickly covered with scale and mites that it would be a difficult matter to stick the point of a pin into the branches or leaves without sticking it through a scale; but only two specimens of black scale were noticed, and these dead with holes in their backs, the punctures of their parasites. The citrus trees in this locality are also attacked by an insect which may prove to be a species of gall fly.

This attacks the branches, which soon after show an abnormal growth from ten to twenty times their natural sizes, and trees once attacked soon become useless.

Amongst the other pests which threaten to prove more particularly troublesome with us are the San José scale, the oblong scale (*Lecanium cymbiform*), the red scale, and the Mediterranean fruit fly.

The first two are only met with in a few orchards, and a vigorous war of extermination is being carried out against them. The San José scale is, on the authority of the Chief Inspector under the Insect Pests Act, at present known to be in seventy odd orchards, and the *Lecanium cymbiform* has hitherto only been met with in a few gardens along the Swan, from Claremont to the Causeway. The eradication of this pest is also in the hands of the Inspectors under the Insect Pests Act.

The other two pests will, as soon as possible, be attacked by means of their own internal parasites.

Early in the year the Department of Agriculture at Rome was communicated with respecting the probable occurrence in Italy of some internal parasites for the Mediterranean fruit fly, but as yet no answer has been received to this communication. Since then the British Consuls at the most important centres in Sicily, Italy, the South of France, and the South of Spain have been written to on the same subject.

This pest, however, requires to be dealt with speedily, and it is to specially trained entomologists that we must look to for discovering natural enemies which will assist in keeping it in check. The pest is now spreading fast amongst our orchards, and some trees had their entire crop destroyed last season. I would recommend that Mr. Compere be instructed to return from the East in time to proceed to the Mediterranean and reach the natural breeding

ground of the fly—(*Haltophora capitata*, syn. *Ceratitis capitata* and *C. Hispanica*), and there closely examine that pest in order to discover in which of its stages it becomes parasitised. Judging by analogy with other flies akin to the one which has obtained a footing here, the parasites would most probably be found to attack the fly when in the pupa stage. No doubt the co-operation of some of the Eastern States, even more interested in the suppression of this pest than we are, could be enlisted in sharing the expenses of searching for these parasites and introducing them.

The red scale will next require our attention. This pest is not known to be parasitised in Australia, where in places it causes a good deal of damage to both trees and fruit.

In its natural habitat—in India and China—it is not considered a pest, and is there known to be kept in check by internal parasitical insects.

Before leaving on his collecting mission last March, Mr. Compere was especially instructed to procure and send over some well-known parasites of the locust, which in the Riverina and the Western Districts of New South Wales decimate swarms of locusts. Owing to the drought, which for several years has extended its grip to the breeding grounds of the locust, these insects have for a time almost disappeared, want of food having starved them out. For this reason no locust parasites have been hitherto received, but the introduction of these useful insects will be well kept in view. It is hoped that the North-West territory of Western Australia will, through the same agency, be protected against the disastrous swarms of locusts which periodically destroy vast areas of the feeding ground there, to the same extent that Riverina and adjacent districts are now in New South Wales, Queensland, and Victoria.

Before closing my remarks on the subject of the introduction of useful insects from abroad, I would like to record the indebtedness we owe to Mr. A. M. Lea, Government Entomologist of Tasmania, for sending us this year a strong colony of the *Leis conformis* ladybird, and promising to follow it up later in the season with more. In return for this valuable introduction we have been able to forward to Tasmania two colonies of a valuable West Australian ladybird (*Chilomenes quadripustulatus*) which, although itself parasitised in this State, yet does a vast amount of good as an aphis and scale feeder.

A. DESPEISSIS,
H. and V. Expert.

14th August, 1902.

Annual Report of Field Officer.

Sir,—I have the honour to hand in a brief Report of the work carried out in the branches of the Department which come under my charge, and some notes on the general work of the Department which has been carried out during the past year, also a list of articles written for the *Journal*, lectures delivered, etc. A new feature in the experimental work has been the commencement of operations at an experimental farm at Narrogin, and I trust that the coming year will see our work extended in other directions.

Experimental Work.

Hamel.—Periodical visits have been paid to the experimental plots at Hamel, where Mr. Berthoud still continues to do good work. Several changes have taken place there during the year. The five-acre block, enclosed in the same fence as the Forest Nursery, has been handed over to the Forestry Department, and our work there consequently curtailed. A ten-acre block of land farther away from the line has been fenced and ploughed, and is now being sown with wheat. A report of the sowing and harvesting operations will be furnished by Mr. G. Berthoud, the officer-in-charge. A large quantity of seed was raised at these plots for distribution. During the year several visits have been paid, and the adjoining blocks inspected and reports furnished thereon, as a result of which, an area of 240 acres has now been reserved for the purposes of an experimental farm, but, so far, no work has been done.

Narrogin.—During March the Hon. Minister for Lands (Dr. Jameson) visited Narrogin, and promised to provide funds for an experimental farm on some land reserved in that district for the purpose. After his return I paid a visit to that locality, and made suggestions as to what work should be carried out, and the approximate cost of operations. The Minister for Lands then authorised the expenditure of a sum of money to enable operations to be started. The work was immediately put in hand, on the contract system, and within a month of the promise being made about thirty men were at work on the farm. The work carried out comprises the erection of 10 miles of fencing, clearing 100 acres of land, ringbarking about 1,200 acres, the sinking of a well, building a house for the foreman, and the eradication of the poison plants on one-half of the land. It was hoped at the commencement to have 100 acres ploughed and sown this season, but, owing to the delays experienced with the men employed clearing, this will not be completed. An area of 36 acres has now been sown, and I anticipate getting a farther block of 10 acres sown next week. A shortage of water on the farm has been a serious trouble, there being none nearer than Narrogin. A well was sunk to a depth of 25 feet, but trouble was experienced in getting men to go below that depth. Some men are, however, now at work, and we hope to obtain a supply of water shortly. The money voted has now either

all been paid out or else is required for work in hand, and a fresh vote is necessary before operations can be continued. Mr. Berthoud, from the experimental plot at Hamel, has been transferred to Narrogin for a month to sow a number of varieties of wheat for test purposes, and to act as foreman until the arrival of the permanent foreman, Mr. A. E. Robinson.

Bunbury.—During the year a large number of new crops have been grown, and a few experiments carried out on behalf of the Department on some land kindly lent to the Department of Agriculture by Mr. F. Hamilton, of "Glen Iris," Bunbury, who also undertook the sowing of the seeds, application of the manure, etc. These plots attracted considerable attention, especially those showing the results of manuring a crop of maize; that having no manure being a failure, while that manured showed considerable improvement. A large board was placed on each plot so that visitors could obtain particulars of the manures applied. An illustration of these plots was published in the June issue of the *Journal*. A report on this work will be furnished by Mr. F. Hamilton, and published in due course. These plots have since been discontinued.

Quindalup.—The small plot started last year at Quindalup has been discontinued, owing to its being too inaccessible for visitors.

I hope in the near future to see this experimental work extended by the extension of the work at Narrogin and the establishment of an experimental farm on a commercial basis in the Geraldton district, and also at Hamel, or some other spot in the South-Western District. This would give us three farms in the different divisions of the State, and the three farms being worked in conjunction would enable us to carry out some very valuable experiments which would be worth to the State many times over the small annual sum that would be required for their upkeep. Most of the money spent would be for improvements, which would add to the value of the farms should it be deemed advisable at any time to discontinue operations.

National Show.—The second National Show of produce was held during March, and passed off very satisfactorily. Circulars were sent out early in November to all societies and people interested, notifying that the show was to be held in March. A large number of entries were received, over 1,500 distinct entries came forward, and the show of produce and manufactured articles eclipsed that of last year. The show was again held in the Queen's Hall, Perth, and the hall being too small for the purpose great difficulty was experienced in allotting the space for the various courts. All districts with the exception of Albany, Newcastle, and Sussex competed, and there was a healthy rivalry among the principal districts for the Champion Prize. The prize was again, for the second year in succession, won by the York Court, with Northam second and Wellington third, this being the decision of the expert judges, and also of the public, who were allowed to ballot for the best dressed court, and a gold medal was presented to Mr. C. Stevens, the Secretary of the York Society, who was in charge of the court. The show was opened on Thursday, March 6th, by His Excellency the Governor,

who was greatly pleased with the splendid display of produce. The Manufacturers' exhibits were much larger this year than last, and applications have already been made for space for the next show. The attendance at the door was very satisfactory, being 50 per cent. more than that of last year. I beg to suggest that in the future this show be held every alternate year, and that the prize money be increased to £100 first, £50 second, and £25 third. The sum paid this year (£40) hardly leaves the winning society any balance after paying their expenses in connection with their exhibit.

Live Stock.—At the instance of our late Minister, Hon. C. Sommers, a number of head of stock were imported from Victoria, they were purchased by Mr. Neill Campbell, of Geelong, and forwarded over as opportunity offered, and all arrived in time to be shown at the Guildford Show. Arrangements were made to accommodate the stock on the show ground, and during the show they were paraded at frequent intervals.

According to instructions received from the Minister, these animals were offered for sale during the show at cost price, and a number of them were sold on the show ground at the prices fixed.

The following is a list of the stud stock imported, and how disposed of:—

Ayrshires—

Ayrshire Bull, "Peverill"; lent to Donnybrook Agricultural Society.
Ayrshire Cow, "Julia"; sold to Hon. H. Saunders.
Ayrshire Bull, "Hamilton"; sold to Hon. H. Saunders.
Ayrshire Cow, "Anna"; sent to Subiaco, and now going to Narrogin; has a bull calf.
Ayrshire Cow, "Lady Louisa II."; sent to Subiaco, and now going to Narrogin; has a heifer calf.

Dexter Kerries—

Dexter Kerry Bull, "Derry"; lent to Mr. C. Harper.
Dexter Kerry Cow, "Denhan Daisy"; sold to W. Rose, Bunbury.
Dexter Kerry Cow, "Denmar"; sold to A. Crawford, Guildford.
Dexter Kerry Cow, "Dalyden"; sold to W. Rose, Bunbury.

Pigs—

Berkshire Boar, "San Toy"; sold to Hon. H. Saunders.
Berkshire Sow, "Silver Bell"; sold to Hon. H. Saunders.
Berkshire Sow, "Mona"; sold to Hon. H. Saunders.

Horses—

Roadster Stallion, "Kinrara"; stood at Marsh's paddock, Guildford, last season, afterwards transferred to Subiaco, and during June sold by public auction to Mr. H. Throssell, Northam.

In addition to the above imported animals, we also sold the two Tamworth sows, "Lady Knowle" and "Lady Melton," to Mr. Pearse, of Rottnest Island, and Mr. F. M. Alcock, of Perth; and also a number of young pigs, reared by the Department at Hamel and Subiaco, comprising 15 Berkshires and 17 Tamworths, for which satisfactory prices were obtained.

During the year the Jersey Bull "Jupiter" was destroyed, owing to being injured, and the Tamworth Boar "Rufus," who was disabled for some time, was also disposed of.

The live stock at present in possession of the Department is as follows:—

Ayrshire Bull, "Peverill"; with Donnybrook Agricultural Society.
Ayrshire Cow, "Lady Louisa II." and calf; going to Narrogin Farm.
Ayrshire Cow, "Anna" and calf; going to Narrogin Farm.
Shorthorn Bull, "Pride of Argyle"; with Mr. J. J. Treasure, Kojonup.
Dexter Kerry Bull, "Killarney"; with Messrs. Lang Brothers, Capel.
Dexter Kerry Bull, "Blythswood Fascinator"; with Mrs. Brockman, Margaret River.
Jersey Bull, "Fowler Lad"; with Mr. G. F. Marsh, Armadale.
Jersey Bull, "Progress Fairly"; with Mr. W. Clifton, Brunswick.
Jersey Bull, "Fowler King"; with Salvation Army, Collie.
Jersey Bull, "Lillian's Progress"; with Mr. H. McNeill, Waroona.
Jersey Bull, "Fowler Boy"; with Mr. A. F. Clifton, Brunswick.
Jersey Bull, "Fowler Bee"; with Mr. N. Brazier, Upper Capel.
Dexter Kerry Bull, "Derry"; with Mr. C. Harper, Woodbridge.

These stock are no expense to the Department, as they are loaned out to settlers, on condition that the animals must be fed and kept in good condition.

Lectures.—During the past year, in addition to the evening class at the Technical School, visits have been paid during August to Jandakot, during November to Gooseberry Hill, during January to Coogee, and during May to Mundijong. At each of these places a lecture was delivered on the subject of "Manures"; their composition and those required for various crops. A day or two was also spent in visiting some of the settlers in these districts. In each instance the lectures were delivered at the instance of the local Agricultural Society, and fair audiences were present on each occasion.

Journal.—During the year articles have been regularly contributed to the *Journal*, and also a Monthly Calendar of Garden Notes. The contributions include articles on Lucerne Growing, the Production of Wheat, Angora Goats, Cultivation of Sweet Potatoes, Importation of Stock, Shipment of Grain in Bulk, Cultivation of Cow Peas, National Show of Produce, Report and Awards, Manures and Manuring, Experimental Notes, Notes on Seeding and Planting, Cultivation of Pumpkins, Squashes, etc.

Quarantine Depôt, Subiaco.—This depôt has proved very serviceable to the Department during the past year, as it has been used as a depôt for all the imported stock, which has been sent there on arrival, and fed until show time, and again after the show until disposed of. Later on a commodious loose box and stockyard was erected for the accommodation of the stallion "Kinrara," who was kept there until disposed of.

Poultry yards were also erected for the accommodation of the imported poultry, but these have since been removed to Narrogin.

A number of young Tamworth pigs were reared there, and also the litters from the imported Berkshire sows, and it proved a very convenient spot for the purpose.

A number of vines for distribution have been rooted, also a number of strawberry plants, paspalum roots, and a quantity

of green fodder grown for the stock. The man in charge has been available for other work when required.

Seed Distribution.—A large number of packets of seeds for experimental purposes have been supplied to settlers during the year; these include all the seeds raised at the Hamel Experimental Plot, and also a quantity of imported seed. These seeds are distributed on the condition that a report is furnished to the Department as to the results and their suitability to the district. This, I regret to state, is only carried out in very few instances.

A large number of rooted vines were also distributed from the Subiaco Depôt last winter, principally to school teachers for planting on the school grounds, and we have a further supply to distribute this winter.

Miscellaneous.—On two occasions a party from Bunbury have visited the Hamel plots. They were met at the plots and conducted round, and the different crops explained to them.

A trial was conducted at Midland Junction with Strawson's Charlock sprayer for the purpose of trying to kill the stinkwort by spraying with bluestone, but the attempt was unsuccessful.

Facilities were also given to Mr. Lee, of Newcastle, to try his special preparation for killing the York Road poison. The trial was not satisfactory, and I think the cost of the operation is prohibitive.

Some experiments were conducted during the season to find a means of carrying eggs for sitting by post or rail so as to preserve the fertility, but, so far, no satisfactory results have been arrived at.

PERCY G. WICKEN,
Field Officer.

Government Refrigerating Works Report.

1ST JULY, 1901 TO 30TH JUNE, 1902.

From the Manager to the Director of Agriculture.

FIFTH ANNUAL REPORT.

SIR,—I have the honour to forward the Fifth Annual Report of the business transactions at the Government Refrigerating Works, for your information.

RE-OPENING OF WORKS.

The Stores were re-opened for business on 1st August, 1901, and closed for necessary cleansing and repairs, and the general over-

hauling of machinery, on 2nd June, 1902; the season extended over a period of a little more than ten months.

Revenue and Expenditure.

A detailed statement of Revenue and Expenditure will be forwarded to you in July after the financial year closes on 30th June. The anticipated increase of revenue is considerably over £300. There will also be an increase of the working expenses on account of the machinery having run "double shift" for a long period.

Consignments.

The consignments are chiefly stored in premises leased by the owners and it is neither necessary nor practicable to make a note of these. Besides these, however, there have been over 12,000 loose packages of various kinds stored in the general stores, and of which a very careful note has to be taken so as to avoid claims being made. As in the previous four years, all the consignments received by me this year have been returned to the different owners, and no claims have been made against the Department for loss or damage of any kind.

The Staff.

The staff, without exception, have worked loyally and well, and it gives me pleasure to intimate the fact, because with a less willing service the extraordinary demands made upon us, both in time and labour, could never have been met except by a greatly increased expenditure.

The Machinery.

The machinery, never having been overtaxed, has worked well throughout the season, without any mishap of any consequence. The former trouble experienced during the hottest weather, of the compressor leathers requiring to be so frequently changed and causing loss of gas and refrigeration, has been largely overcome this season by the engineer adapting another mould. The instructions and apparatus sent by Messrs Hull to remedy this trouble, were found after trial to be of very little service.

The Stores.

The stores have again been well patronised, but not by any means up to their carrying capacity. All the smaller stores have been under lease for varying periods, as well as two of the larger stores. All these stores are on the ground floor. None of the stores upstairs have been used continuously for any length of time. The installation of an electric lift, now arranged for, will make these stores upstairs more accessible and useful. Another aid to economy and profit would be the duplication of our machinery. Less refrigerating power would suit our requirements at the beginning and end of each season, but the

present machinery has to be run whatever the requirements of the stores may be. The present retail character of the business done by the department makes it extremely difficult to raise a satisfactory revenue to meet the expenses. The volume of business is not large enough in Perth, and because it is a retail business the work in connection therewith is greater and the revenue smaller than would be the case if the works were situated at Fremantle in a position to take cargoes from the steamers, fishing boats, etc., and to supply these with ice in large quantities. A building erected at Fremantle to suit the purpose for which it is required, and proper machinery to do that work, would afford very great facilities for the inspection of all edibles imported; and the supervision of exports, and, in addition, the income would be trebled without involving much more expenditure than at present, and the work would be very much less. Fish cargoes and meat cargoes are the legitimate work of a Government, and the retail trade could very well be left to private firms. The position at present is that a cargo is distributed in Fremantle and Perth, and the goldfields in small quantities, and the works here being entirely confined to storage suffers most in the revenue part of the transaction.

Produce Stored.

The bulk of revenue is received from imported produce. There has been no local development worth noting from a storage point of view. From last season's business it was hoped that the revenue this season would be greatly increased by the storage of local fruit, eggs, milk, etc. These expectations have not been realised. The relaxation of the import conditions prevented any fruit, either local or imported, from being stored. The storage of local eggs has been very small, and scarcely any local butter but what had been repacked by grocers. The increased revenue is mainly attributable to the revival of the frozen meat trade, and if this is not entirely due to the shortage of cattle and sheep in the State, I look for a larger income from this source in future, provided the late monopoly of cold storage space on the inter-State steamers does not obtain sole control, which, I am at present informed, there is some danger of being accomplished. The storage of frozen meat in large quantities is one of the sources of revenue upon which the department must rely for recouping the Government for the past expenditure and the great amount of labour involved.

Railway Arrangements.

The railway arrangements have not always been as satisfactory as they might have been, and after all our trouble in the matter we are yet a long way off direct communication with the Port when frozen produce is being consigned here. There is this much to be said, however—that till owners exert themselves more than they do to see that proper arrangements are made with the Railway Department and carried out, things will not be much better.

Ice.

The Railway Department has taken less ice than formerly, the explanation being that cool cars have not been required except by the Perth Fresh Food and Ice Company, and the company supplied any ice that was required for the cars used by them.

The Government departments have taken a greater quantity than formerly, and I recommend that it should be arranged that Government money should not be spent elsewhere for services that we can render. I took a good deal of trouble in this matter last year, and the result has been very satisfactory; but still there are orders for ice, etc., which do not come here. It has always been a cause of complaint that the ice made here was opaque and not clear. To remedy this as much as possible, a distilling plant is being erected, from which next season it is expected great benefit will be derived.

Insanitary Conditions.

The insanitary conditions at the entrance to the stores still prevail. This is caused by the storing of the market refuse on our platform. The cure for it is the removal of the refuse several times a day, direct from the markets. Without exaggeration, that evil-smelling refuse being stored and kept stewing under a hot sun constitutes one of the greatest plague spots in the city, and, being placed in such close proximity to the food supplies of Perth and district, makes matters very serious indeed. In any case, it is manufactured in the markets, and should not be placed at the door of the Government Refrigerating Works to drive away customers or cast reflections on the conditions under which the foods are received and delivered.

Conclusion.

As I am going on "leave of absence" in the first week of June, I send this report for your perusal, previous to my leaving, in case you should require further information.

All the work requiring to be done has been arranged for, as well as the "leave of absence" of officers.

The repairs and overhauling of the machinery, and the cooling of the stores, cannot be completed for an earlier re-opening than 21st July; but as we are closing, a week does not matter much at that period of the year.

I have, etc.,

JOHN GRESHAM,

Manager.

Government Refrigerating Works.

1st July, 1901, to 30th June, 1902.

Statement of Revenue and Expenditure.

Revenue.

	£	s.	d.	£	s.	d.
Collected at Works—						
Storage				369	19	6
Rents				1,254	15	2
Ice				215	16	4
				£1,840	11	0
Outstanding Accounts to be Collected—						
Department of Agriculture, Rent, Ice, etc.	26	19	0			
Perth B nd, Ice	0	3	0			
R. W. Hardey, Ice ...	3	1	11			
G. B. Leonard, Ice ...	0	3	8			
Santa Rosa Vineyard, Ice	7	10	3			
Police, Ice	5	3	6			
Railway Department, Ice	8	10	0			
Legislative Council, Ice ...	5	12	6			
Hospital, Ice	39	7	0			
				96	10	10
				£1,937	1	10

Memo.—Year 1900-1 this total was £1,596 4s. 10d.

Expenditure.

	£	s.	d.
Salaries (Office and Stores)	524	13	10
Do. (Machinery Department)	738	12	0
Coal	404	5	0
Freight	178	8	6
Electric Light	91	10	9
Sanitary Service	3	18	0
Water	17	17	9
Gas (Carbonic Anhydride)	38	13	4
Calcium	14	10	0
Compound	14	5	0
Ice Delivery	26	8	9
Oils	49	12	5
Leather	5	17	0
*Alterations to Building, Supplies for repairs and overhaul and minor repairs and requisites, and painting roof	313	5	2
	£2,421	17	6

John Gresham,
Manager.

* With the exception of about £70 this item should not all be charged to one year, as permanent improvement to Building and Machinery is included.

COMPARATIVE STATEMENT OF BUSINESS.

	1900-1.	1901-2.
Money collected at Works ...	£1,435 ...	... £1,840
Large Ice stored	998 blocks ...	... 1,205 blocks
Small Ice stored	1,053 blocks ...	... 3,073 blocks
Supplied to Government Departments	867 small blocks ice	2,751 small blocks
Supplied to Government Departments	19 large blocks ice ...	60 large blocks
Supplied to Railway Department	391 large blocks ice	56 large blocks
Value of Ice to Railway Department	£76	... £8
Large Ice to Vineyards	65 blocks ...	... 145 blocks
Total number of Packages dealt with, not including goods stored under lease	10,000 packages	... 10,953 packages
Number of Boxes Butter stored ...	6,049 boxes ...	... 7,600 boxes
Quantity of Coal used	310 tons ...	... 404 tons
Amount of Freight paid	£128 19s. 4d.	... £178 8s. 6d.
Cost of Ice delivery	£10 12s. 2d. ...	... £26 8s. 9d.
Cost of Water	£135	... £17 17s. 9d.
* Number of Delivery and Cash Receipts written out	... ...	... 10,000 receipts
Rents collected	£999	... £1,255
Storage collected	£315	... £370
Ice Sales	£120	... £216

* Does not include memos., book entries, and other miscellaneous records.

JOHN GRESHAM,
Manager.

Annual Report of the Government Botanist.

THE DIRECTOR,—I have the honour to report as follows on work done by me during the twelve months ending 30th June, 1902:—

Identification of Plants.—Specimens were received at all seasons of the year, with inquiries for the names and characteristics of the plants, which were identified and reports made concerning them. Many of these plants are immigrants from foreign countries, and for their determination a comprehensive series of works on the botany of all parts of the world is required. Reports of a more special nature were made on Paraguayan Tea (*Ilex Paraguensis*), Sisal Hemp (*Agave Sisalana*), Vetivert (*Andropogon muricatus*), Sandarac Pine (*Callitris verrucosa*), Canaigre (*Rumex hymenosepalus*), Camomile (*Anthemis nobilis*), Mexican Thistle (*Argemone Mexicana*), Sorrel (*Rumex Acetosella*), and Saltbushes. Among noxious plants, what appeared to be the true Nut-grass (*Cyperus rotundus*) was received from only one locality, near Cue, and along with the specimen came the statement that the plant was valued as forage for cows. The Stinkwort (*Inula graveolens*) has evidently spread much in the State, and another plant of the same family,

Erigeron linifolius, has been sent in from various localities. The latter resembles stinkwort in some respects, and this may account for its being taken notice of by settlers. Though much less to be feared than stinkwort, it is however a very hardy plant, flourishing through the dry season, and should be watched.

Seeds of useful and ornamental plants have been received by exchange from various botanic institutions and distributed in various ways; while those cultivated by Mr. Berthoud at Drakesbrook were sent to the different public institutions having gardens attached, and to all who applied for them, and they were highly appreciated. The want of a properly organised Botanic Garden is greatly felt in connection with the utilisation of rare and valuable seeds or plants received from abroad. In many instances when these are distributed nothing further is heard of them, even from institutions under Government control.

Herbarium.—By means of exchange, 339 specimens were received, while 253 were sent out, and 75 were acquired by purchase. Collecting materials were supplied to three overland expeditions, the leaders having consented to undertake the collection of botanical specimens during their journeys. Mr. R. I. Anketell, on the staff of Mr. John Muir, in his expedition for the survey of the line of the Transcontinental Railway, in addition to his duties as a surveyor, made a collection of some thousands of specimens between Kanowna and Eucla. These included a large number of interesting plants, though on account of the season being winter a large proportion of them were without flowers. From Mr. F. S. Brockman's expedition for the exploration of the West Kimberley District, about 100 specimens of much interest were received. A number of settlers and travellers in different parts of the State have forwarded specimens and seeds with information concerning the plants, thus contributing in the most disinterested way to the elucidation of the natural vegetation of the State.

The need for suitable presses for the preservation of specimens has been demonstrated by the injury caused by insects, which have been very destructive during last summer, as well as by dust and soot, the cupboards in which the larger half of the collection is packed being neither insect proof nor dust proof. A Herbarium cannot be arranged or maintained in an orderly and workable condition without suitable accommodation and the literature necessary for the purpose; and the lack hitherto of these means has occasioned much loss of time in doing the most indispensable work, while hindering progress and ignoring future necessities. Specimens and books are equally needed for botanical work, and in addition to providing for the daily duties of those in immediate charge, a public Herbarium should also serve for the reference of all who are interested in plants from a scientific, utilitarian, or ornamental point of view. It might also serve a useful purpose in connection with such instruction in botany as may be given in the State schools. As illustrating the inconvenience caused by the backward condition of the Herbarium, may be mentioned the deficiency of

specimens of the numerous species of poison plants, about the effects of which we hear so much, most of those in the collection being imperfect and unsuitably prepared fragments of such plants as settlers have forwarded, from time to time, for identification and for information, towards which the Herbarium furnishes in many cases little or no assistance.

ALEX. MORRISON,
Government Botanist.

30th June, 1902.

Insect Pests Act.

ANNUAL REPORT.

JULY 1ST, 1901—JUNE 30TH, 1902.

THE DIRECTOR,—The work under this Act may be divided into two main heads: The inspection of orchards, vineyards, and gardens within the State, and the inspection and disinfection of fruit and fruit trees entering through the various ports.

The orchards and vineyards within the State now number over three thousand, and cover an aggregate area of about 10,000 acres. These orchards and vineyards, both in number and area, are constantly being added to, so that the work of inspection becomes heavier each succeeding season. At the present time there are only four inspectors to carry on the work of examining orchards and enforcing action in cases where diseases are found. Owing to the great distance over which these orchards are spread—from Northampton to Albany—it will readily be understood that it is not possible with the present staff of inspectors to make such frequent and thorough inspections as is necessary to eradicate and prevent the spread of injurious orchard pests.

Every effort has been made during the past twelve months to check the spread of the San José scale, and to hasten its complete eradication. All the orchards in which this disease has been found at any time have been inspected during the past year, and an effort made to reach all places not formerly visited, so that we might possess exact information as to how far this pest has been disseminated. Many of the orchards in which this scale had formerly existed were found to be clean, while a number of places inspected for the first time were found to be infested, thus showing the necessity of making a complete examination of all orchards and gardens if this disease is to be stamped out or controlled. Altogether the San José scale was found in 109 orchards, of which 56 were inspected for the first time during the period covered by this report. To enable the fruit grower to cope with this pest

expeditiously and economically, a number of fumigating tents have been made for the treatment of diseased trees. These tents are loaned free of charge, and the chemicals necessary are supplied at cost price. During the past year over 1,500 trees affected with the San José scale were treated by means of the appliances supplied by this department. In the majority of instances the treatment has proved successful and there is little reason to doubt that a continuance of the same methods will ultimately secure the complete extermination of this pest.

Undoubtedly the greatest menace to the local fruitgrowers is the fruit-fly pest, which is gradually extending its destructive influence to the country districts. The whole of the country for a radius of 20 miles around Perth may be described as more or less affected by the ravages of this pest, and isolated outbreaks have also been reported from York, Newcastle, and Dongara, while a number of orchards in the Pinjarra district were found to be affected. It is hoped that the action taken in the three first-named places has been successful in stamping out the pest, but the fly appears to have obtained a hold in the Pinjarra district. No doubt the ordinary and natural means of locomotion possessed by the fruit fly are greatly added to by the use of second-hand fruit cases, which may contain the fly in the pupa stage, and thus distribute it about the country. Most of our leading orchardists are wise enough to decline to allow old cases to come on their premises, but their care is often rendered unavailing by their improvident neighbours' indifference. The Regulations under the Insect Pests Act provide that the use of second-hand cases is prohibited unless properly disinfected, but it is certain that this section is largely disregarded, and its enforcement would only be possible by the employment of a large army of inspectors. The present high price of new cases is a great factor in inducing fruitgrowers to stick to old packages, and the practice of marketing fruit in new cases only is not likely to become general until the present rates are considerably reduced, while the spread of the fruit-fly and similar pests cannot be checked so long as the use of old cases continues.

During the summer months, when the fruit-fly is active, constant attention is given by the inspectors to those localities in which this pest occurs, and orchardists are compelled to gather and destroy all fallen fruit so as to prevent the grubs entering the ground, from whence they again emerge as flies to carry on their destructive work. All fruit offered for sale in auction marts and shops is inspected, and any found affected by this pest is condemned and destroyed by burning. Over 300 cases were seized and condemned on this account during the past summer, in addition to large quantities of affected fruit destroyed in the orchards.

At the beginning of the period dealt with by this report, the Regulations under the Insect Pests Act were amended to permit the importation of apples, pears, quinces, and other fruits formerly prohibited. This alteration has naturally resulted in a largely increased quantity of fruit being imported into this State, thereby

adding considerably to the work of the inspectors at the ports. To thoroughly and expeditiously cope with the importations, extensive shed accommodation, fitted with the most approved conveniences for the disinfection of consignments was erected, and a staff of four additional inspectors appointed to carry out the work of inspecting and disinfecting fruit and fruit trees entering through Fremantle. Every necessary provision has been made to insure all importations being promptly and efficiently inspected and disinfected to guard against the introduction of injurious pests which have not, up to the present time, become established within our border.

During the year just completed 106,689 cases of fruit were received at the various ports, as against 35,795 cases for the previous twelve months. The returns for the past year show increases in the importations of almost all kinds of fruits, but the principal increases are represented by apples, 23,512 cases; oranges, 13,003 cases; bananas, 11,010 cases; plums, 2,693 cases; pears, 2,462 cases; and an increase of 2,091 cases of lemons.

Many of the earlier consignments of apples and pears which arrived immediately the prohibition was raised were found to be severely affected by the codlin grub, mussel scale, and other diseases, and to be generally of very inferior quality. But the rigid enforcement of the regulations, which provide for the destruction of diseased fruit, has had the desired effect of inducing shippers to send forward only clean fruit of good quality.

Of the total of 106,689 cases of fruit received, 93,255 cases were passed and delivered after inspection and disinfection as clean, while 11,332 cases were found to be decayed, and 2,102 cases were condemned and burned on account of disease. It will thus be seen that notwithstanding the fact that considerable quantities of fruit were condemned at the commencement of the season, the total quantity of fruit condemned on account of disease for the year amounted to less than two per cent. of the total shipped to the State. This small percentage is surprising when it is borne in mind that the earlier consignments of apples and pears not infrequently contained as much as fifty per cent. of diseased fruits, while some small lots were destroyed entirely. As showing the condition of the fruit arriving at the period referred to, I might quote two consignments of apples containing a total of 391 cases, of which 173 cases were condemned and destroyed on account of being affected by the codlin grub. This state of affairs has changed, however, since shippers and importers alike realise that diseased stuff will not be passed, and the condition of the fruit now arriving is highly creditable to all engaged in the trade, while the figures quoted should conclusively answer and disprove the charges of unnecessary severity which have been made against the regulations governing the importation of fruit.

In the importation of fruit trees and plants, which are also inspected and fumigated at the port of entry, a small increase appears over the returns for the preceding year. The total for the

past year amounted to 161,942, as against 140,366 for the preceding twelve months. The principal kinds imported were apples 50,423, oranges 23,703, peaches 17,100, and ornamental and pot plants, 28,300. These figures are sufficient to show that the local fruit-growing industry is expanding apace, as the apples, oranges, and peaches inported during the past year would plant approximately about 1,000 acres, to which has to be added vines, and all other kinds of fruit trees, as well as the stock raised and supplied by local nurseymen.

The fees collected at the various ports for the inspection and treatment of fruit, fruit trees, and other plants, amounted to £2,988 13s. 4d., a sum more than sufficient to cover the whole cost of administering the Insect Pests Act, though the receipts are, of course, paid directly into the public revenue.

As the local fruit-growing industry is yearly increasing in magnitude and importance, the necessity for the careful inspection of orchards, to guard against the spread of disease increases proportionately. The presence of pests, such as the fruit fly and San José scale, are sufficient in themselves to warrant a very close watch being kept, while the introduction of codlin moth is now rendered probable by the importation of hard fruits from the Eastern States. To effectively combat the spread of such pests as are already in our orchards, as well as to prevent the introduction of others from outside, the appointment of additional field inspectors becomes imperative, as the present staff is too small to visit all the orchards and vineyards, even once in the course of twelve months, though the necessities of many cases require visits of much greater frequency. The fruit-growing industry in West Australia at the present time has the advantage of being free from many pests which orchardists in other countries have to battle with, and it is to be hoped that these pests will not be allowed to obtain an ascendancy through want of means to check them.

G. Buchanan,
Chief Inspector.

7th July, 1902.

Annual Report of Sub-Editor of "Journal" and Librarian.

To the Director,—I have the honour to report on the *Journal* and Library as follows:—

The Journal.—It is pleasing to note that the increased circulation of the *Journal* during the last twelve months amounts to three hundred additional copies.

Prior to November, 1901, the *Journal* had been printed by a private firm. At that time arrangements were made with the Government Printer, who has since been printing it.

The last few issues show a decided improvement by reason of the greater number of articles contributed by the officers. Contributions of much interest have been sent in from the Stock, Rabbit, and Forestry Departments.

During the year I have visited Hamel, Gingin, Fremantle (Fruit Sheds), and Subiaco for the purpose of photographing items of interest for reproduction in the *Journal*.

Considerable damage has been done to the very valuable stock of blocks belonging to the Department by reason of the want of a proper receptacle in which to keep them. I would urge that a cabinet (the same as those supplied to printers for the purpose) be purchased at a cost of about £10, which would preserve the blocks indefinitely and save the amount expended in the first six months. The blocks now on hand cost between £400 and £500; and these, kept as they are at present, depreciate at the rate of 25 per cent. per annum, so that the expenditure would be a good one.

The Library.---This has been considerably added to during the last twelve months, especially in regard to the publications from the other States and elsewhere, which have been bound and placed on the shelves; the library being much used both by the general public and officers of the Department.

Considerable inconvenience and waste of time has been experienced by the want of a proper index to the contents of the library. Both the public and the officers of the department have often wanted information on certain subjects that I have known to be in the library, but could not find without a long search and waste of time. On more than one occasion I have spent half a day in looking up one item. In order to overcome this, at the beginning of May last, I commenced a complete and exhaustive "card index." This work will take at least another twelve months to complete, with the present assistance I have, but it will, when finished, well repay the time spent on it.

We are very much in want of the later standard books on matters appertaining to the Department, a list of which was forwarded to the honourable the Minister some time back, but I do not know if they were ordered or not. I am repeatedly asked by the general public for some of the books, and regret being unable to supply.

I have, etc.,

GEO. C. BAKER,

24th June, 1902. Sub-editor and Librarian.

Annual Report of Poultry and Bee Expert.

Poultry.

Poultry breeding and keeping in this State can scarcely be said to be in a very satisfactory condition from some points of view. Last year we imported eggs from the Eastern States to the value of something like £60,000. With the climate and facilities we have here there is no reason why any eggs should be imported at all. These figures show an increase of nearly £10,000 over the importation of eggs for the previous year, 1900, which shows that the poultry industry instead of advancing is going backward. There are two reasons that may account for this unfortunate state of affairs: the first and most important is the prevalence of the poultry tick throughout many of the districts in this State. It is so bad in many places that it is almost impossible to keep fowls in a healthy condition, and many thousands of fowl are annually killed by it; and I have seen over a quart of ticks taken out of a single fowl-house, and have known 75 per cent. of the fowls in one place to die before the cause of the disease became known. It is rapidly spreading, and the whole poultry industry of the State is seriously threatened by it.

The other cause is the purchase of the wrong kinds of poultry by the farmers. While there has been a strong disposition on the part of the farmers to improve the breed of their poultry, many of whom have not spared expense to try and do so, it has unfortunately often been a case of zeal without knowledge, and the direct result has been an improvement of the stock for table purposes, but a serious deterioration so far as egg production is concerned. Want of knowledge as to what the various breeds of poultry are adapted for has much to answer for.

This want of knowledge I have tried to overcome, as far as possible, by articles in our *Journal*, and also by lectures given in nearly all parts of the South-West Division of the country. In these lectures I dealt with the various breeds, and illustrated them with lime-light views from photos of the various breeds, and explained the characteristics of each and what they were best suited for. The lectures were attended by about two thousand men, women, and children, and I have no doubt will be helpful in bringing about a better state of things. At the same time, there are many parts I have not been able to reach yet, and who are still in ignorance.

In this State it is unfortunate that we have a number of poultry diseases that seem to be peculiar to the country, and that up to the present have not been properly diagnosed, and each year cause a great number of deaths. The same also applies to ducks, great numbers of which die every year from some disease which appears to be unknown.

It would be a boon to poultry farmers if some medical man were subsidised to take the matter up and study the diseases of poultry in West Australia, and find out proper remedies. At present the poultry breeders are working in the dark, and all they can do is try various remedies in the hope that by chance they may strike the right one; but it is disheartening work.

What is most needed is the spread of more information among the poultry farmers of this State. From the same number of fowls that are in the country at present double the number of eggs that are now obtained could easily be got by the use of the right kinds of fowls; and even from those that are here a great increase might be obtained by a more judicious method of feeding and better looking after in the winter months.

I have also given a great many practical illustrations of caponising, and caponised over two hundred birds in the past twelvmonths. A number of people are now regularly going in for it, and find that they can get high prices for the capons.

At some periods of the year here eggs are very plentiful and cheap, and when that is the case the eggs could be cheaply and safely stored in the Government Refrigerating Works, where special arrangements are made for their reception. This industry is assuming vast proportions in the Eastern States; and last year in New South Wales over one hundred thousand dozen of eggs were thus stored until satisfactory prices were obtainable. Eggs stored as an experiment in the Government Refrigerating Works here, after being kept in cool storage for three months, 91·4 per cent. of them were found to be perfectly good, and could not be distinguished from fresh eggs. It is to be noted that these eggs were not specially selected, but bought in open market. A small poultry farm has been started by the Department, with three separate breeds to commence with. One for table purposes—the silver grey Dorkings; one for laying purposes—the black Hamburgs; and one for general purposes—the buff Orpington. It is also intended to obtain some American bronze turkeys. Within two weeks after the announcement that the Department intended obtaining some pure bred poultry, applications for forty-one dozen of eggs came in at 10s. per sitting, thus showing that it will meet a want.

As regards turkeys in this State, they are of a very inferior description, and the introduction of fresh blood is greatly needed. The system of inbreeding that has so long been in vogue in this State is accountable for the miserable specimens so commonly seen.

Because poultry breeding is only, as a rule, looked upon as one of the minor industries of the farm it is apt to be despised, but it is really a most important one, and on a well-managed farm is a considerable source of income. At the present time in Victoria it is said to bring in more money than the wool industry of the whole State.

I would recommend that lectures be given all over the State, illustrated with lantern views, not only in the farming districts, but also in the large centres of population, for fowls are kept everywhere, often by persons who know little about them, but who would gladly learn if the means to do so were put in their way. The information even to townspeople who only keep a few fowls would be useful, for it would mean their getting more eggs from the same number of fowls that they now keep, and help them to keep their poultry in a more healthy condition.

BEE-KEEPING REPORT FOR 18 MONTHS ENDING JUNE 30TH, 1902.

The interest in bee keeping for the past year and a-half has shown a decided increase among the farming community of this State, and many farmers are now making it a considerable source of income. Until some two and a-half years ago, with the exception of a few beekeepers who went in for bee keeping as a business, the most of the farmers were content with the old-fashioned box hive, which simply meant a kerosene or gin case turned upside down and put on a stand in the garden. When it was thought that the hive was full of honey the bees were suffocated and the honey taken out, and the brood destroyed. By this method only small yields of honey were obtainable, at the most probably not more than between thirty or forty pounds of marketable honey, often not half of that quantity.

During the past $2\frac{1}{2}$ years I have made a special effort to combat that crude and barbarous way of dealing with the bees, and, I am pleased to be able to report, with very great success. At all the agricultural shows I visited I took round with me a properly constructed hive and other bee appliances, and explained their use and also the advantage of using such appliances; for not only could the honey harvest be increased at least four fold, but the bees were not destroyed. I also lectured on the subject in many parts of the State, and illustrated my lectures with lime-light views and the bee appliances. I also visited a large number of farms where bees were kept under the old system, and gave practical lessons on how to properly work and handle bees, not only to the residents of the farm, but often to a considerable number of others who came for the information. The modern system of bee keeping is now making rapid progress, and the modern bar-framed hive is now to be seen in all portions of the State where bees are kept.

A number of supposed cases of the disease known as "foul brood" were reported to me, and in each case I visited the place and inspected the hives and bees, and am pleased to say that in every

case it was a false alarm. In days past the bees of this State were more than decimated by this fell disease, but for the past three years I have not known of an authenticated case.

Beekeepers under the old style, during the past 18 months, have suffered great losses from the wax moth, especially those who kept Black bees, in many cases the whole of the hives having been destroyed by the pest.

In most instances the writing to the department for information was too long delayed, and on visiting the places it was found that nothing could be done to save the remnant.

In other cases, when assistance was asked in time, most of the hives have been saved by the use of proper hives and the introduction of Italian blood.

The past season has not been a very good one in most districts for the honey harvest, especially in the earlier part of it; but later in the season there was a fair flow of honey.

Although there has been such an increase in the interest taken in bee keeping there is nothing like as much as should be, when we consider the capabilities of the country. In the red gum districts of the State probably no more suitable places for bee farms are to be found in the world; and the amount of honey that can be extracted from a single hive in a good district is almost incredible. I have known of over 500lbs. of honey to be taken from one hive in the season.

If the Education Department would encourage their teachers in the country districts to keep bees and give lessons on bee keeping to the scholars much good might result. This is done elsewhere, and boys and girls are taught how to work and manage bees.

Bee keeping is work that can be satisfactorily carried out by women. In America some of the most successful bee farmers are women; and there is no reason why it should not afford employment to many here. The work is light, varied, and profitable, and it will not take a great many hives in a suitable district to keep a family with the necessities of life.

There is much still to be done in the way of educating the people, and but little can be done by writing. The most satisfactory way is to visit and give practical instruction, and the next best is to illustrate the subject with photographs through a lantern on a screen. Wherever I have lectured on bees and bee keeping, I have always had large and attentive audiences; and the general desire seems to be for information.

ALEX. CRAWFORD.

21st May, 1902.

Department of Agriculture.

Expenditure and Receipts for financial year 1901-2.

EXPENDITURE.

	£	s.	d.
Salaries	6,407	4	9
Contingencies—			
Incidental expenses	648	17	5
Experimental Plots, Quarantine Ground	414	1	2
Library and Museum	75	0	0
Office Rent	250	0	0
Postage, Telephone, Telegrams ...	264	15	7
Publications	245	10	6
Stationery	47	7	0
Travelling Dairy	147	12	6
Analysis	41	15	0
Insect Pests Act	1,051	5	7
Contagious Diseases (Bees) Act ...	21	8	3
Noxious Weeds	888	15	3
National Show	344	12	6
Travelling Expenses	32	18	7
Refrigerating Works, Fuel	694	4	6
Do. Materials for Upkeep	331	3	3
Refrigerating Works, Annual Overhaul	49	9	2
Maintenance of Shed, Cattle	98	12	0
	£12,155	5	6

RECEIPTS.

	£	s.	d.
Orchard Fees	70	3	9
Rent, City Markets	560	17	6
Refrigerating Works	1,970	16	3
Disinfecting Fruit, Fremantle	2,784	3	7
Do. Outside Ports	187	5	3
Journal	97	6	9
Fees for Shed, Cattle and Horse	42	16	0
Noxious Weeds	9	19	8
Agricultural Seeds	24	0	2
Sales of Cattle and Horse	319	15	11
Miscellaneous	231	12	4
National Show, Admission and Advertising	135	19	6
	6,434	16	8
Balance of Expenditure over Receipts	5,720	8	10
	£12,155	5	6

28th July, 1902.

J. Buckley,
Accountant.

MARKET REPORT.

For Month ending 30th August, 1902.

The West Australian Farmers' Co-operative Company, Limited, City Markets, Perth, report sales in undermentioned lines for month ending 30th August. The feature of the past month has been the substantial rise in price of hay and chaff, also bran and pollard :—

Farm Produce.—Chaff market very excited; prices have advanced from £7 15s. to £8 5s. per ton for best quality; inferior and medium lines £6 to £6 10s. per ton; straw chaff, £4 to £4 5s. per ton. Hay, in bales, £6 15s. to £7 10s. per ton. Baled straw, £3 to £3 10s. per ton. Wheat: Market steady at 5s. 4d. to 5s. 7d. per bushel for truck lots; smaller lots, 5s. 8d. to 5s. 10d. per bushel. Oats: Algerian, scarce, 4s. 4d. to 4s. 6d. per bushel; New Zealand, 4s. 7d. to 4s. 8d. per bushel. Flour: £11 to £11 5s. per ton for local; imported, £12 to £12 10s. per ton. Potatoes: New, local, £12 to £14 per ton; imported potatoes, £8 to £9 10s. per ton; seed potatoes, £10 to £11 per ton. Onions, £10 10s. to £11 10s. per ton.

Dairy Produce.—Local butter market easier, 1s. 4d. to 1s. 9d. per lb.; imported butter, 1s. 4d. to 1s. 8d. per lb. Bacon: Market firmer, 1s. to 1s. 0½d. per lb.; Hams, 1s. to 1s. 3d. per lb. Cheese, 9½d. to 10½d. per lb. Honey, 60lb. tins, 15s. each. Eggs: Market has been gradually receding, as is customary at this season; prices ranged from 1s. 8d. down to 1s. 1d. per doz.

Fruit.—Market dependent mostly upon imported lines. Apples, local, 16s. to 26s. per case; imported, 12s. to 16s. per case. Oranges, 7s. 6d. to 14s. per case. Lemons, 7s. 6d. to 9s. per case. Cape gooseberries, 4½d. per lb. Strawberries, 1s. 3d. per lb. Bananas, 24s. to 26s. per case.

Vegetables.—Cabbages, 5s. to 7s. 6d. per cwt.; cauliflowers, 3s. to 8s. per dozen; Swedish turnips, £7 10s. to £9 per ton; pumpkins, £10 to £12 per ton; bunch roots scarce; carrots and parsnips, 2s. 6d. to 3s. 3d. per dozen bunches; turnips, 8d. to 1s. 3d. per dozen bunches; celery, 2s. 6d. to 3s. per dozen; beetroot, 2s. 6d. to 3s. 6d. per dozen; salads, 6d. to 9d. per dozen.

Poultry.—Good prices ruling for all prime birds forward. Table fowls, 6s. 6d. to 8s. per pair, other fowls, 5s. to 7s. per pair; chickens, 4s. 6d. to 5s. 6d. per pair; ducks, 9s. to 10s. 6d. per pair; geese, 14s. to 16s. per pair; turkey gobblers, 18s. to 27s. per pair; hen turkeys, 12s. to 13s. per pair; well bred fowls, 10s. to 20s. per pair.

Live Stock and Carcase Meat.—Pigs scare. Prime porkers, 30s. to 40s. each; forward stores, 18s. to 25s. each; backward stores, 12s. to 14s. each; suckers and weaners, 8s. to 9s. 6d. each; carcase pork, 7½d. to 8d. per lb.; heavy weights, 6d. to 6½d. per lb.

GARDEN NOTES FOR OCTOBER.

By Percy G. Wicken.

The unusual period of dry weather during the month of August will have the effect in many districts of causing a very short supply of vegetables, settlers in our Eastern districts being prevented from planting. On the other hand, this dry weather in the winter is an advantage to many of the moister parts in the

South-West, where a dry winter is a distinct benefit, and those residing in these parts who have taken advantage of their opportunities should reap a corresponding benefit. By the time these notes appear in print, however, we all hope a change in the climatic conditions will have taken place, and that we will have been favoured with a good fall of rain, and if so, every effort should be made to take full advantage of it and get all seeds put in as quickly as possible, so as to enable them to obtain a good root-hold before the hot weather comes on. A liberal supply of good, well-rotted stable manure is the best fertiliser that can be obtained. All available house refuse, manure, and rubbish should be saved and made into a compost heap; in the course of a few months it is astonishing what a large-size heap will accumulate, and this, when well rotted, should be dug into the vegetable garden. Where stable manure cannot be obtained a good bone-dust is about the best substitute, and the more highly soluble manures can be used as a top-dressing. Strict attention must be paid to the working of the soil, as much depends on this. The soil should be broken up as deeply as possible, and brought to a fine tilth, as this enables it to contain the greatest amount of moisture possible to carry the plants through the long dry summer; the surface should also be kept loose and well stirred, as this destroys the capillary action of the soil, and enables it to retain the moisture instead of allowing it to evaporate, as is the case in the unworked soil. It is only a waste to apply quantities of good fertilising material to a badly-worked soil. To get satisfactory results good fertilising and intense cultivation must go together. Weeds will now be making their appearance, and these must be kept cut down, so as to give the plants the full benefit of the food and moisture in the soil. B[illegible] worms and other insect pests will also be troublesome; a sharp lookout must be kept for these and means taken to destroy them as soon as they can be detected.

Beans (French or Kidney) are a very valuable summer vegetable. They are prolific, and, if properly looked after, and the beans pulled as soon as they are fit, will continue bearing for a long period, but if the beans are allowed to mature they will go out of bearing very quickly. They should be sown in drills 24 to 30 inches apart, and from 4 to 6 inches apart in the drills. A little Thomas phosphate and sulphate of potash are the best manures to apply.

Beans (Lima).—This is a most delicious bean of high nutritious qualities. The bean is eaten green, like green peas, or they may be dried and used as a haricot bean. There are both dwarf and climbing varieties. The Black Pole is one of the best climbing varieties. They deserve a great deal more attention from gardeners than they have yet received. Plant the same as French beans for the dwarf varieties and the climbing varieties on a trellis.

Beans (Madgascar).—Also called the Poor Man's Bean. It is hardy, prolific, and a good climber; very useful for growing over a fence or outhouse. The whole pod is eaten, the same as the French bean.

Beet (Red.)—A few rows may be sown so as to keep up a succession. Do not use fresh manure for the crop, as it causes the roots to become forked.

Beet (Silver).—The leaf of this plant is used as a vegetable. They require to be heavily manured, so as to induce the leaf growth.

Cabbage.—Plant out any young plants now ready; they will probably require a little water when planted out to give them a start. Sow a small quantity in seed bed for future use.

Carrots.—Sow a few drills to keep up a succession.

Cucumbers.—Sow a few drills to keep up the supply.

Lettuce.—Plant out from the seed bed, and sow a little more seed. They require forcing along with liquid manure so as to make a quick growth.

Melons (Rock, Water, and Preserving).—Plant as many of these as you are likely to require. Do not plant the water and preserving melons near each other as they will cross fertilise and destroy the value of both varieties.

Onions.—Sow a little seed and keep those already growing well cultivated.

Parsnips.—Sow a few rows in deeply-worked ground.

Potatoes.—If not already sown plant out some of the quick-growing varieties.

Peas will still do well in the cooler districts. Those sown now should come in in time for the Christmas market.

Pumpkins and Squashes.—Sow as many as possible; what you do not require can be stored for future use, they are valuable both for table and feed for stock. Plant in hills from 6ft. to 12ft. apart each way according as to whether they are bush or running varieties.

Tomatoes.—Plant out as many of this valuable plant as possible. Those planted early will require staking and tying up. Manure well and look out for the cut worms and other insects.

Farm.—This should be a busy time on the farm, and as many of the summer crops as possible should be sown before the end of the month. Melons, pumpkins, maize, sorghum, cow peas, soy beans, mangels, and millets must all be sown as speedily as possible. The weather will soon be warm, and the danger from bush fires will be increasing, it is advisable to take all reasonable precautions against this enemy by ploughing fire-breaks round the growing crops of grain, and also round all out-buildings, stables, etc. In the early and warmer districts harvesting wheat for hay will be the most important operation; the present prospects of the harvest are that there will be a small area to cut, and that the growth, except in favourable localities, will be stunted. The price of chaff will probably keep at a high level during the year, and therefore no straw should be wasted. Those who have not already done so should get their reapers and binders and other harvesting implements in good order, so as to have no delays when harvesting commences.

CLIMATE OF WESTERN AUSTRALIA FOR AUGUST, 1902.

This month was, on the whole, remarkably dry and warm, with very high barometers. The total quantity of rain registered at Perth was by far the lowest on record. The weather was certainly very bright and pleasant, but so dry as to cause serious complaints from all the central agricultural areas. A tropical disturbance passed through the State in the middle of the month, giving fair to heavy rains throughout, with the exception of the districts between Perth, Newcastle, Northam, and York, generally considered to be our central agricultural areas, and where rain was, unfortunately, most urgently required. The rain commenced in the North-West districts (tropics) on the 11th, and travelled throughout the interior in a Southerly direction, barely touching the West coast. When it reached the South coast it spread out (as appears to be a habit of this class of storm) towards the Leeuwin, and on the 16th and 17th very heavy floods were experienced in the extreme South, in the neighbourhood of Albany, where 560 points were registered in 48 hours. The disturbance gradually passed to the Eastern States, bringing good rain throughout the dry Northern districts of South Australia on the 19th and following days. During the remainder of the month there were a few showers in South-West districts, and fairly general though mostly light rains were registered throughout the State South of Sharks Bay on the 25th. The rainfall on the whole was far below the average for previous years, except on the Goldfields and in the extreme South.

Frosts were experienced inland on several occasions; the temperatures recorded by a minimum thermometer on the surface of the ground being as follows:—

TERRESTRIAL MINIMUM TEMPERATURE.

Station.	Mean.	Lowest.	Date.
Cue	44·3	32·5	1
Coolgardie	39·6	27·8	5
Southern Cross	36·4	25·0	4
Walebing	34·8	29·0	5, 8, 10, 17
York	35·0	29·0	11
Perth Observatory	40·2	34·0	3
Bridgetown	36·9	27·0	9, 10, 13
Karridale	38·9	30·0	10
Katanning	33·3	24·5	8, 9

The Climate of Western Australia during August, 1902.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					August, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	30·028	29·996	30·171	29·901	88·3	68·6	78·4	97·9	59·8	91·5	67·5	105·0	54·0	Nil	2167
Derby	30·013	29·012	30·149	29·919	92·1	59·2	75·6	95·8	50·2	88·7	60·0	102·0	45·2	Nil	1507
Broome ...	30·014	29·022	30·172	29·912	87·6	58·8	73·2	95·0	50·5	84·7	55·7	98·8	40·0	Nil	2222
Condon ...	30·058	29·048	30·233	29·948	81·8	52·8	67·3	92·5	40·2	80·3	52·1	93·0	37·0	Nil	2074
Cossack ...	30·082	29·054	30·287	29·964	80·6	56·5	68·6	90·1	49·1	79·2	59·4	94·0	45·8	Nil	1297
Onslow ...	30·086	29·092	30·226	29·952	79·7	51·7	65·7	87·6	42·0	79·0	51·2	94·0	39·0	12	394
Carnarvon ...	30·108	29·098	30·267	29·965	74·5	51·6	63·0	90·6	42·3	75·9	51·8	92·0	40·0	38	807
Hamelin Pool...	30·114	29·103	30·315	29·933	74·7	49·6	62·2	83·0	41·4	70·9	48·0	79·8	35·7	58	499
Geraldton ...	30·160	29·125	30·385	29·965	72·1	48·3	60·2	85·0	39·8	67·9	50·7	82·0	38·0	74	1219
INLAND:															
Hall's Creek ...	30·082	...	30·300	...	86·1	...	...	90·0	...	85·4	50·7	95·2	32·8	Nil	1387
Marble Bar ...	...	...	...	...	85·5	55·8	70·6	94·5	41·5	...	...	...	...	37	1202
Nullagine ...	30·088	...	30·356	29·923	80·6	49·9	65·2	91·0	32·8	77·9	46·2	88·8	32·8	70	1285
Peak Hill ...	30·144	29·107	30·429	29·845	71·7	49·1	60·4	80·3	42·4	69·6	45·9	83·8	36·4	74	1850
Wiluna ...	30·174	..	30·458	29·892	69·2	42·6	55·9	79·6	31·0	...	...	...	...	96	1300
Cue	30·168	29·126	30·421	29·914	72·2	48·5	60·4	79·9	37·5	69·1	45·5	86·0	31·0	43	844
Yalgoo ...	30·158	29·125	30·422	29·938	71·3	45·2	58·2	82·0	45·0	67·8	43·7	85·3	31·5	51	541
Lawlers ...	30·176	29·115	30·442	29·992	68·6	45·3	57·0	78·3	32·1	67·8	44·8	85·2	28·2	89	991
Laverton ...	30·210	...	30·458	29·996	67·2	43·5	55·4	75·7	29·6	...	...	...	...	79	978
Menzies ...	30·222	29·118	30·464	29·960	66·1	45·5	55·8	76·8	34·0	65·6	44·3	83·8	29·7	112	1024
Kalgoorlie ...	30·212	29·120	30·489	29·908	66·3	44·6	55·4	76·8	36·3	64·8	44·9	82·0	34·0	159	804
Coolgardie ...	30·238	29·115	30·445	29·915	66·7	43·6	55·2	77·0	34·0	64·6	43·7	81·0	31·2	171	855
Southern Cross	30·205	29·106	30·450	29·950	67·6	41·4	54·2	79·4	29·0	65·1	41·4	82·0	25·0	83	812
Walebing ...	...	...	...	...	68·2	40·9	54·6	79·0	32·0	...	...	...	...	84	857
Northam ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
York	30·220	29·114	30·458	29·879	67·9	39·1	53·5	75·6	31·8	62·4	42·0	78·4	29·0	62	780
Guildford ...	...	...	...	...	71·0	43·1	57·0	81·8	31·0	...	...	...	...	41	1659

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during August, 1902—*continued*.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					August, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	* Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens	30·204	29·107	30·481	29·904	69·0	46·0	57·5	79·8	39·4	65·4	47·2	83·5	33·6	48	1915
Perth Observatory	30·216	29·110	30·481	29·904	68·2	47·2	57·7	80·0	40·3	63·4	48·1	78·2	37·5	46	2032
Fremantle ...	30·232	29·081	30·432	29·930	66·9	50·4	58·6	77·0	44·0	62·8	49·8	73·8	38·0	63	1829
Rottnest ...	30·202	29·084	30·454	29·870	65·5	53·6	59·6	76·2	47·6	63·3	50·0	72·5	36·0	85	1766
Mandurah ...	...	...	...	...	67·8	41·8	54·8	76·0	35·5	...	...	...	...	92	1937
Wandering ...	...	...	...	...	64·5	34·6	49·6	73·0	28·2	...	...	..	...	111	1223
Collie	...	...	...	...	65·0	36·8	50·9	74·9	29·2	...	...	...	...	166	1963
Donnybrook ...	...	...	...	...	66·0	42·3	54·2	72·7	34·8	...	...	...	...	99	2186
Bunbury ...	30·241	29·078	30·454	29·947	66·6	44·3	55·4	75·0	39·0	62·2	46·2	75·5	33·0	82	1872
Busselton ...	...	...	...	...	65·8	44·6	55·2	74·0	36·5	...	...	...	...	75	1991
Bridgetown ...	...	...	...	...	65·2	38·7	52·0	76·0	28·0	...	...	...	...	187	2198
Karridale ...	30·224	29·073	30·426	29·815	64·4	44·7	54·6	74·5	35·5	61·6	46·7	72·0	32·5	415	3395
Cape Leeuwin	30·208	29·018	30·426	29·727	63·1	53·2	58·2	72·2	48·4	61·6	52·4	70·8	43·5	269	2383
Katanning ...	30·240	29·078	30·441	29·821	63·0	40·0	51·6	72·0	32·0	60·2	40·9	75·1	30·8	203	976
Albany ...	30·258	29·044	30·457	29·793	63·4	46·0	54·7	73·0	39·4	59·7	46·6	77·5	36·0	720	3101
Breaksea ...	30·262	29·024	30·463	29·719	61·1	51·1	56·1	72·8	46·2	59·7	49·7	74·8	34·5	432	2039
Esperance ...	30·260	29·068	30·467	29·881	66·8	46·0	56·1	72·4	36·2	63·5	45·6	82·8	34·0	75	1445
Balladonia ...	30·265	...	30·518	29·995	64·9	42·2	53·6	72·5	31·3	...	...	...	...	105	715
Eyre	30·254	29·096	30·560	29·030	63·4	41·8	52·6	76·5	29·0	64·8	44·4	88·7	30·2	109	1015

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
4th September, 1902.

W. E. COOKE,
Government Astronomer.

RAINFALL for July, 1902 (completed as far as possible), and for August, 1902 (principally from Telegraphic Reports).

Stations.	July.		August.	
	No. of points 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham ...	Nil	...	Nil	...
6-Mile	Nil	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	Nil	...
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	Nil	...	Nil	...
Flora Valley ...	...	...	...	...
Ruby Creek ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Beagle Bay ...	...	...	...	...
Obagama ...	Nil	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	Nil	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	Nil	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	Nil	...	Nil	...
North-West:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
De Grey River ...	...	...	...	...
Port Hedland ...	Nil	...	30	2
Boodarie ...	Nil	...	...	...
Yule River ...	...	...	...	...
Warralong ...	Nil	...	...	...
Muccan	...	...	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Pilbarra	...	...	25	...
North-West—cont.				
Coongon	...	...	...	...
Warrawagine ...	...	...	...	...
Braeside... ...	...	...	...	...
Bamboo Creek ...	Nil	...	23	1
Marble Bar ...	Nil	...	37	1
Warrawoona ...	...	...	27	1
Corunna Downs...	Nil	...	...	...
Nullagine ...	Nil	...	70	...
Yandicoogina ...	...	...	...	...
Tambourah ...	...	...	...	...
Kerdiadary ...	...	...	...	...
Roy Hill... ...	...	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	...	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	...	...	...	...
Millstream ...	...	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	Nil	...	7	...
Cooyapooya ...	...	...	...	...
Woodbrooke ...	Nil	...	...	...
Croydon	Nil	...	...	...
Balla Balla ...	Nil	...	9	2
Roebourne ...	Nil	...	2	1
Cossack	Nil	...	Nil	...
Fortescue ...	45	2	15	1
Mardie	...	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	...	...	...	...
Onslow	6	1	12	1
Peedamullah ...	Nil	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	Nil	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	...	...	...	...
Point Cloates ...	25	3	...	...
Gascoyne:				
Winning Pool ...	Nil	...	13	1
Towara	...	...	...	...
Ullawarra ...	Nil	...	...	...
Maroonah ...	Nil	...	...	...
Thomas Police St'n	...	...	...	...

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
GASCOYNE—*contd.*				
Bangemall ...	Nil	...	...	...
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	6	1	...	...
Yanyeareddy ...	Nil	...	...	...
Williambury ...	Nil	...	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	69	8	...	...
Boolathana ...	...	...	...	...
Carnarvon ...	47	4	38	2
Cooralya	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	85	2	...	...
Clifton Downs ...	63	1	...	...
Dairy Creek ...	...	...	...	...
Mt. Clere ...	...	...	...	...
Errivilla	...	...	...	...
Dirk Hartog Island	...	...	...	...
Sharks Bay ...	90	4	...	...
Kararang ...	138	14	...	...
Meedo	...	...	...	...
Tamala	...	...	...	...
Wooramel ...	92	6	...	...
Hamelin Pool ...	95	7	58	4
Byro	79	3	...	...
Yarra Yarra ...	60	2	...	...
Berringarra ...	43	2	...	...
Mt. Gould ...	10	1	...	...
Moorarie	...	...	...	...
Wandary... ...	3	1	...	...
Peak Hill ...	Nil	...	74	5
Horseshoe ...	Nil	...	...	...
Abbotts	Nil	...	135	3
Belele	...	...	...	...
Mileura	37	2	43	2
Milly Milly ...	...	...	...	...
Manfred	79	3	...	...
Meelya	...	...	...	...
Woogorong ...	...	...	...	...
Boolardy	...	...	...	...
Billabalong ...	42	2	...	...
Wooleane ...	70	3	...	...
Murgoo	91	2	...	...
Meeka	116	4	...	...
Mt. Wittenoom ...	108	5	...	...
Nannine	17	2	77	4
Star of the East...	19	2	81	4
Annean	27	2	...	...

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
GASCOYNE—*contd.*				
Tuckanarra ...	18	1	68	5
Coodardy ...	53	1	...	...
Cue	73	2	43	3
Day Dawn ...	65	2	34	1
Lake Austin ...	60	2	45	2
Lennonville ...	85	5	16	1
Mt. Magnet ...	63	3	17	1
Warracoothara...	...	...	...	...
Challa	69	2	...	...
Youeragabbie ...	...	...	...	...
Murrum	109	4	17	1
Burnerbinmah ...	77	4	...	...
Yalgoo	95	8	51	2
Gabyon	...	...	...	...
Barnong	186	2	...	...
Gullewa	...	...	...	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	249	13	...	...
Mt. View ...	182	13	...	...
Yuin	119	5	48	3
Northampton ...	321	9	129	4
Mt. Erin ...	...	...	...	...
Oakabella ...	460	10	123	4
Narra Tarra ...	364	9	...	...
Tibradden ...	...	...	...	...
Sand Springs ...	...	...	...	...
Mullewa... ...	185	12	74	5
Kockatea ...	186	10	19	2
Bootenal ...	386	10	...	...
Geraldton ...	402	14	74	4
Greenough ...	387	11	77	4
Dongara ...	392	10	127	2
Dongara (Pearse)	371	12	...	...
Strawberry ...	399	12	...	...
Mingenew ...	371	13	32	5
Rothesay ...	152	...	...	...
Field's Find ...	...	...	...	...
Carnamah ...	294	16	52	5
Watheroo ...	266	13	...	...
Dandaragan ...	559	15	34	3
Moora	266	10	51	2
Yatheroo ...	666	17	35	3
Walebing ...	354	16	89	4
New Norcia ...	539	14	65	3

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	1084	15	97	4
Belvoir	740	18	74	3
Mundaring ...	848	18	...	...
Guildford ...	750	16	41	4
Kalbyamba ...	990	19	48	5
Canning W't'r'w'ks	1115	16	...	...
Perth Gardens ...	995	19	48	4
Perth Observatory	1090	21	46	4
Subiaco	960	19	47	4
Claremont ...	953	21	54	3
Claremont (Richardson)	862	15	...	...
Fremantle ...	956	21	63	6
Rottnest	839	23	85	5
Armadale ...	932	16	69	4
Rockingham ...	930	20	110	5
Canning River ...	1008	15	...	...
Jarrahdale ...	1101	18	53	2
Mandurah ...	770	19	92	5
Pinjarra	824	19	47	5
Yarloop	694	19	51	5
Harvey	761	22	106	8
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	313	10	48	4
Momberkine ...	309	13	67	3
Mouglin ...	428	14	56	3
Culham	414	13	63	3
Newcastle ...	461	16	52	4
Eumalga ...	546	15	65	4
Northam ...	359	16	...	...
Grass Valley ...	300	14	63	2
Meckering ...	255	12	30	3
Cunderdin ...	248	11	75	4
Doongin	288	10	24	4
Cuttening ...	202	16	...	...
Whitehaven ...	292	11	31	3
Sunset Hills ...	330	15	118	6
Cobham	389	18	57	3
York	369	16	62	6
Beverley ...	377	14	88	5
Barrington ...	326	13	...	...
Sunning Hill ...	375	13	...	...
Wandering ...	556	16	111	11
Pingelly ...	339	14	54	4
Marradong ...	632	17	100	7

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
SOUTH-WEST—*contd.*				
Bannister ...	542	16	...	...
Narrogin ...	348	17	141	7
Wickepin ...	353	15	...	...
Gillimanning ...	293	15	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury ...	729	21	82	8
Collie	892	23	166	8
Salvation Army Settlement	800	20	...	...
Glen Mervyn ...	821	13	...	...
Dardanup ...	860	18	113	6
Donnybrook ...	948	20	99	7
Boyanup ...	687	18	137	6
Busselton ...	960	24	75	9
Margaret River	857	26	...	...
Lower Blackwood	1155	18	...	...
Karridale ...	1212	28	415	14
Augusta ...	1031	27	468	12
Cape Leeuwin ...	953	28	269	9
Biddellia ...	1414	24	279	9
The Warren ...	1538	22	...	...
Lake Muir ...	595	25	...	...
Mordalup ...	519	23	...	...
Deeside	639	26	...	...
Riverside ...	662	22	...	...
Balbarup ...	798	22	340	11
Wilgarup ...	744	24	320	11
Mandalup ...	986	21	183	5
Bridgetown ...	934	24	187	11
Greenbushes ...	908	18	105	3
Greenfield ...	520	14	197	7
Glenorchy ...	277	9	...	...
Williams ...	484	17	128	7
Arthur	378	16	129	7
Darkan	391	13	...	...
Wagin	386	15	197	8
Glencoe ...	334	16	...	...
Dyliabing ...	271	16	...	...
Katanning ...	334	15	203	8
Kojonup ...	468	15	229	7
Broomehill ...	387	16	216	10
Sunnyside ...	367	17	183	8
Woodyarrup ...	303	14	180	9
Cranbrook ...	...	...	...	...
Blackwattle ...	448	13	...	...
Mt. Barker ...	556	20	595	8
Kendenup ...	447	20	417	12

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
th-West—*contd.*				
St. Werburgh's ...	470	19	...	...
Forest Hill ...	660	26	...	...
Denmark ...	447	20	636	8
Albany	745	19	720	10
Point King ...	779	18	536	11
Breaksea ...	467	21	432	12
Wattle Hill ...	...	...	...	...
Cape Riche ...	435	14	691	10
Pallinup ...	279	15	164	7
Bremer Bay ...	253	15	439	9
Jarramongup ...	237	12	...	...
stern Division:				
Lake Way ...	Nil	...	96	5
Mt. Sir Samuel ...	8	2	89	5
Lawlers	22	2	89	5
Leinster G.M. ...	Nil	...	...	...
Lake Darlôt ...	...	...	...	...
Diorite King ...	...	...	...	...
Sturt Meadows ...	...	...	...	...
Mt. Leonora ...	41	3	64	6
Mt. Malcolm ...	...	...	...	...
Mt. Morgans ...	47	2	75	6
Burtville ...	46	2	80	7
Laverton ...	43	3	79	6
Murrin Murrin ...	46	3	74	6
The Granites ..	63	3	68	3
Tampa	34	1	...	...
Kookynie ...	50	4	122	8
Niagara	...	...	120	...
Yerilla	53	4	134	5
Edjudina ...	64	7	...	...
Menzies	11	...	142	4
Mulline	38	2	...	...
Wangine ...	...	...	...	...
Waverley ...	31	3	120	6
Goongarrie ...	36	4	113	4
Mulwarrie ...	61	5	132	7
Kurawa	37	5	177	6
Kurnalpi ...	53	5	48	5
Bulong	46	5	105	6
Kanowna ...	36	5	253	5
Kalgoorlie ...	41	5	159	7
Coolgardie ...	64	7	171	5
Burbanks P.O. ...	68	7	150	7

Stations.	July. No. of points. 100 = 1in.	July. No. of wet days.	August. No. of points. 100 = 1in.	August. No. of wet days.
Eastern—*contd.*				
Burbanks Birthday Gift	65	6	155	5
Woolubar ...	63	5	...	...
Widgiemooltha ...	75	7	118	6
50-Mile Tank ...	89	7	...	...
Norseman ...	78	8	119	7
Bulla Bulling ...	82	...	177	6
Woolgangie ...	96	5	200	4
Boorabbin ...	82	8	254	7
Karalee	121	6	170	5
Yellowdine ...	116	6	86	5
Southern Cross ...	115	10	83	6
Mt. Jackson ...	83	4	130	5
Bodallin ...	89	4	...	...
Burracoppin ...	...	...	142	4
Kellerberrin ...	186	9	21	4
Mangowine ...	133	9	...	...
Wattoning ...	77	2	...	...
Eucla Division:				
Ravensthorpe ...	197	12	86	9
Coconarup ...	147	13	...	...
Hopetoun ...	217	16	93	8
Fanny's Cove ...	346	7	...	...
Park Farm ...	237	14	...	...
Esperance ...	253	13	75	11
Gibson's Soak ...	203	11	...	...
30-Mile Condenser	163	...	...	...
Swan Lagoon ...	187	16	...	...
Grass Patch ...	199	15	...	...
Myrup	295	12	...	...
Lynburn ...	211	14	...	...
Boyatup	264	13	...	...
Middle Island ...	...	...	...	...
Point Malcolm ...	139	13	...	...
Israelite Bay ...	59	6	99	8
Bulbinia ...	...	...	...	...
Frazer Range ...	104	8	...	...
Balladonia ...	91	7	105	8
Southern Hills ...	100	8	...	...
Eyre	85	11	109	9
Madura	...	...	...	...
Mundrabillia ...	...	...	...	...
Eucla	27	7	47	5

The Observatory, Perth,
4th September, 1902.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during August, 1902.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	9073	7994	1079	1079	5640	...	1719	...	...	176	...	291	133	21	...	...	...	10	4
Albany	225	214	11	11	108	...	35	...	...	26	...	40	5	...	...	...	...	...	..
Geraldton ...	2	2	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	..
Esperance ...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	9300	8210	1090	1090	5748	...	1756	...	...	202	...	331	138	21	...	...	...	10	4

Department of Agriculture,
6th September, 1902.

Return of Fruit Trees and Plants imported into Western Australia during August, 1902.

Name of Port.	No of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.															
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	29	27399	28	27237	1	162	...	5492	100	10343	7	2	13	214	25	20	4032	2385	1670	1585	1250	...	99
Albany ...	10	2586	9	2574	1	12	...	255	...	814	23	396	3	12	...	...	50	176	178	238	409	...	20
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	1	132	1	132	...	...	...	...	...	12	12	12	...	12	...	...	12	12	12	24	24	...	...
Total ...	40	30117	38	29943	2	174	...	5747	100	11169	42	410	16	238	25	20	4094	2573	1860	1847	1683	...	119

Department of Agriculture,
6th September, 1902.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

ANNUAL SHOWS.—Secretaries of societies are requested to send in reports of their respective annual shows, for publication in the *Journal* of the Department of Agriculture. All copy must be addressed to the "Editor of the *Journal*," and reach the Department on or before the 8th of the month.

NOTICE TO SUBSCRIBERS.—In order to keep in touch with growers throughout the State, correspondence is invited from persons having items that might prove of interest to others, to send them in to the editor of the *Journal*. As the exchange of ideas is often resultant of good, it is to be hoped that our readers will take advantage of the opportunity offered; at the same time enabling the Department to offer such advice to those requiring it, and so assisting and keeping in touch with those living in isolated places where the Inspectors of the Department are unable to visit.

HORSE-BREEDING.—If ever there was a chance of horse-breeding being a remunerative industry, it ought to be now. Not only have the British Isles been depleted of horse stock by the war, but the same thing has happened to many countries from which we have been accustomed to draw supplies. Now that our heroes are home again, they will want hunters and polo ponies. With business getting a better tone, high-class harness horses are bound to be in demand. But it takes the best part of six years to produce a hunter "fit to carry a gentleman," even if every circumstance connected with him goes well. Of other horses we seem to have plenty. Pedigree hackneys were not sent to South Africa, and lots of superior young ponies are coming on.—*Live Stock Journal.*

THE HUMUS OF THE SOIL.—In arid regions and in sandy soils the loss of humus is most severely felt. Under these conditions the humus of the soil should be increased by the use of well prepared farm manures, green manures, and by a systematic rotation of crops in which grasses, or preferably, clover, form an important part. There are certain soils, however, that do not need humus. Swampy, peaty, and muck soils contain a large amount of humus. If the soil is sour to the taste, the acid may be neutralised by a dressing of lime or wood ashes. Soils from poorly drained places frequently contain sour humus. Very frequently muck soil is deposited over marl beds. Marl, which is a mixture of limestone and clay, may be used as a top-dressing for muck soils. A soil well stocked with humus will withstand drought better, furnish more available plant food, and hence larger crops, and give better returns for fertilisers applied than one deficient in this substance.

Painting Outhouses.—In this country, where the sun's rays at times beat down mercilessly, and cause timber to shrink and warp, the damage to buildings can be, in a measure, prevented by the use of paint. Nothing adds so much to the appearance of the farmstead as a few coats of paint applied to the buildings and fences, unless it be a nice grove of trees and a fruit garden. During the waiting days of March the mixture could be applied, or else after seeding was through. The following recipe for a paint is cheap, and may be applied by any person:—Slack half-bushel fresh lime with boiling water, strain through a fine strainer, and add 1 peck salt (previously dissolved), 3lb. ground rice boiled to a thin paste, and stirred in boiling hot, 1lb. Spanish whiting and 1lb. of glue, previously dissolved. Add 5 gallons hot water to the mixture, stir well, and let it stand a few days, covered. It should be put on hot. About a pint, properly applied, will cover a square yard. With lamp-black or venetian red, any dark or reddish shade can be made.—*Exchange.*

Producers' Co-Operative Union.—A preliminary meeting of intending shareholders in the West Australian Producers' Co-Operative Union, Limited, was held in the museum of the Department of Agriculture on 11th September. Mr. Charles Harper, M.L.A., presided, and there were also present Messrs. M. H. Jacoby, M.L.A., W. Atkins, M.L.A., Whistler, Turner, Adams, Hawkins, Fry, Fawcett, and Batt; all these gentlemen being shareholders in the Union. A draft memorandum and articles of association were submitted and adopted. It was decided that a minimum of five and maximum of 200 shares should be allowed to each shareholder. Mr. Whistler moved that a sufficient number of shares had been applied for to constitute a company, and that the company be declared formed. The motion was seconded by Mr. Fawcett, and carried. It was decided that a director's qualification should be 20 shares, and that the number of directors should be seven. Five of the directors were then appointed. A ballot was taken, resulting in the election of Messrs. Harper, Atkins, Jacoby, Whistler, and R. Gell. Instructions were issued to have the company registered.

Distension of the Paunch.—Dulness and loss of appetite are the symptoms first noticeable at the onset of the disease. Swelling of the abdomen generally and in the left side in particular then appears, and at the same time rumblings of the stomach are heard and there are occasional discharges of gas by the mouth. When the bulging part of the left flank is pressed upon by the fingers over-distended paunch is felt to pit very much after the manner of a piece of dough, and when the part is struck with the hand the drumlike sound so marked in hoven is altogether absent. As the stomach enlarges the play of the lungs is interfered with, and breathing becomes quick and embarrassed. In this disease, as in hoven, pain is denoted by grinding the teeth, grunting, and moan-

ing. In the advanced stage of the affection the patient obstinately stands, or, should the animal lie down, the body invariably rests on the right side. The object of treatment should be to restore tone to the paralysed rectum and cause the speedy removal of the contents. For this purpose two to four ounces of aromatic spirits of ammonia, with 12 to 20 ounces of Epsom salts, may be given in two quarts of thin, cold gruel. After two hours this should be followed by a drachm of carbolic acid rubbed upon a little soft soap and given in three pints of cold water. Should the medicine fail to produce any reduction of the body, then the paunch may have to be opened and its contents removed by an experienced person.—*Exchange.*

INFLUENZA IN HORSES.—One of the essential conditions in the successful treatment of influenza in horses, is relieving the animal from fatigue and work whenever the first signs of illness become apparent. These signs are generally diminished appetite, listlessness, weakness, dry hot mouth, hanging head, swollen eyes, and perhaps shivering. To work and fatigue the horse after the disease has seized him is to expose him to the risk of a more severe attack than he otherwise would have, and may lead to his death. Therefore, cessation of work at once is all important. Good nursing comes next in importance, for the amateur—and even the veterinary surgeon, for that matter—can do little more than place the patient in the best possible hygienic conditions and maintain the strength. More horses are injured than benefited by the administration of drugs in this and many other diseases. Good ventilation, keeping the horse's body warm and comfortable, and giving soft and easily-digested food are the chief points to be attended to. If the symptoms are mainly those of catarrh, then the treatment should be the same; and if the chest is affected, treatment should be the same as for pleurisy and inflammation of the lungs; and when the bowels are implicated the treatment prescribed for inflammation of them must be adopted. When the legs and other parts of the body swell they should be kept as warm as possible by means of woollen bandages and rugs. Salicylic acid should be given in one-drachm doses in a little thick gruel, twice a day, when the animal is recovering. In order to counteract the debility it is advisable to give vegetable and mineral tonics. The best of these for the horse are powdered gentian and sulphate of iron—an ounce of the first and two drachms of the second, in a ball, once or twice a day. Boiled linseed is advantageous. The horse should not be put to work until quite recovered, and even then this should be rather light, for sometimes the disease is undoubtedly infectious.—*Exchange.*

IRRIGATION AND ROOT MANAGEMENT.

By A. Despeissis.

How Plants absorb Water.

Plants, flowers, and fruits are made up mostly of water. Analysis shows that there is as much as 90lbs. to 94lbs. of water in every 100lbs. of some of the more succulent fruits and vegetables, such as asparagus, cabbages, cucumbers, lettuce, melons, rhubarb, tomatoes, and strawberries; as much as 80lbs. to 85lbs. of water in every 100lbs. of such fruit as apples, apricots, grapes, lemons, and pears; green fodders contain 60 to 85 per cent. of water according to their state of maturity. It is essential that the contents of the cells which enter into the structure of the growing plant should be in a half-liquid condition in order that nourishment and construction material should be carried and distributed wherever required, be it in the stem, the tender buds, or the ripening fruit. When the cells cease to be distended with fluid sap they get flaccid and the plant wilts. Unless this state is promptly remedied by an influx of sap these cells thicken, they lose their elasticity, the plant first gets stunted and finally dries up and dies. The water necessary for plant growth is absorbed by the hair-like rootlets issuing from the stronger roots which penetrate the ground in search of food and moisture; it does not, however, enter into the circulation of plants quite pure, but contains in solution variable quantities of substances which plants feed upon. From these rootlets it is passed on from cell to cell, by a process of diffusion, first along the larger roots which anchor the plant to the ground, thence to the stem, on to the branches, the buds, leaves, and fruit.

That cell-to-cell motion, or that diffusion of the nourishing sap, from the capillary rootlets to the tip of the branches, is quickened by evaporation.

The evaporating organs of the plants are the leaves. These, when fanned by the breeze, allow a considerable amount of moisture to escape through the stomata or breathing pores. In bright daylight these pores open to allow the admission of carbon and of oxygen to the working cells of the leaves. As this takes place a good deal of the moisture which saturate the air in the intercellular spaces of the leaves escapes to the drier outside air. A vacuum is thus created, and more moisture exudes from the gorged cells to replace the amount lost through evaporation. In this manner a current of sap is created from the rootlets upwards towards the branches.

Under certain circumstances this current may run quicker than the plant is able to absorb moisture from the ground. This is noticeable on a dry, hot day, when the plant flags.

This being so, it is easy to understand that other conditions of soil texture and of particular plant requirements being alike, a

given field crop or trees of the same sorts and age will show signs of wilting and need for water much sooner in the drier air of the inland districts than in the moister air of the coastal zone. In both instances the soil may have been wetted to saturation point by the winter rains; but, evaporation being more active inland than on the coast, that store of moisture is more rapidly exhausted in the first instance as compared with the second.

This perspiration of the leaves keeps the plant cool when everything else around is scorched, but as soon as that perspiration ceases leaves and fruit get burned. Whenever, therefore, perspiration threatens to stop for want of moisture rising from the roots we find in watering and in irrigation a ready means of stimulating it.

Advantages of Irrigation.

In the coastal districts of Western Australia, where fruit growing is more extensively carried on, little or no heed has hitherto been paid to the advantages of irrigation. The reason is that within that zone which is more directly under the beneficial influence of monsoonal and maritime climate, that climate is consistent and not capricious. The ground receives a deep and a thorough soaking every winter, and the air is all through the year charged with a sufficiency of moisture which checks a too rapid or too prolonged evaporation or perspiration through the leaves. Further inland, however, these conditions are not noticeable to the same extent. The rainfall is not so abundant and the evaporation is greater; furthermore, adequate and suitable water for irrigation is often deficient.

Numerous spots, however, are found dotted over the country where irrigation can be carried out with profit and ease. In such places, and wherever deep and thorough drainage is associated with it, irrigation eliminates any risks arising from any freaks and anomalities of the season. Such privileged spots are always for that reason much sought after. Although alive to the value and potentialities of these spots, few owners however, have hitherto taken advantage of their sources of water supply and led them along suitable channels to where they can double or treble the production of the ground.

Evils of Irrigation.

Although irrigation has been a source of large profits to some, it may be said to have, on the other hand, led in as many cases to considerable losses. The practice should only be adopted with judgment. The initial cost of leading water on to the land may be so great that the expenditure may not be justifiable. Moreover irrigation without efficient and thorough drainage is always fatal, sooner or later. The ground thereby alternately gets chilled and baked; there is no get away for the water except by evaporation; this cools the ground to a point which is uncomfortable and detrimental to vegetation and leads to the rotting of the roots. In

irrigating or watering an orchard, the water should never be led or poured into a cup-shaped bowl, dug around the stem. This causes a gummy exudation to ooze out at the crown of the tree, and the plant dies of collar rot. The stem should always be protected from actual immersion in water by a small mound of earth which is banked up around it.

Irrigation on ground which is not naturally well drained or where no attempt has been made to deep drain the soil is often the cause of the displacement of masses of injurious alkaline salts from deep down towards the surface, where they finally accumulate and corrode the roots and stem and kill the trees. Much valuable information on this rising of the soluble alkalies in irrigated soils is due to Professor Hilgard's researches in California. It has been shown that the presence of as much as a quarter of one per cent. (·25 = 8,750lbs. on one acre of soil 1ft. deep) of carbonate of soda, one of the most corrosive of soil alkalies, renders that soil sterile.

Over-irrigation is one of the greatest causes of failure in the hands of the amateur irrigationist. In a climate like ours, where the ground is well soaked during the winter months, there is little need to water the trees until early in summer if on deep loamy ground. Two or three more thorough waterings at intervals of a month, followed up by thorough cultivation and pulverisation of the surface ground, would thence meet the requirements of most trees.

A good soaking is better than two or three niggardly waterings, which, instead of encouraging root growth deeper down into the soil, attract the tender rootlets towards the moistened surface, where they lie exposed, to be hacked about by implements of cultivation, or to be dried up should a hot, dry spell of weather set in.

The benefit derived from irrigation is often annulled for neglect to suitably manure the land. It stands to reason that, if a soil can supply the necessary plant-food for half a-dozen successive crops of, say, two tons of fruit to the acre, without showing any need for a supplement of that food in the shape of manure, it will when producing, say, four tons of fruit, when put under intensive culture, with the aid of irrigation, show signs of falling off much quicker than it would otherwise have done.

The belief *that a crop is all right because it has been irrigated*, unfortunately proves only too often a delusion; unless the operation can be carried out at a reasonable cost, with suitable water, on well-drained ground, properly manured, and unless the operation is not overdone, irrigation cannot be profitable. It is also essential, when orchards and vineyards are concerned, that the pruning and thinning operations should receive proper attention and that pests and blights should be vigorously suppressed and not allowed to share with the owner the surplus crop which irrigation carried out under favourable circumstances always ensures.

Water Measurement.

The cultivator who handles water must be able to determine fairly accurately the amount of water needed for a crop on a given soil, and a few figures in relation to the measurement of water will be helpful in calculation:—

1 gallon of water weighs 10lbs., and measures 277,274 cubic inches.

1 cubic foot of water weighs 62½lbs., and contains 6¼ gallons.

1 ton of water contains 224 gallons, and measures 36 cubic feet.

1 inch of water over an acre of land weighs 101 tons, and therefore means 22,624 gallons, an amount which would be held in a tank with a 3,600 cubic foot capacity.

A miner's inch is the amount of water running from a hole one inch square with a head pressure of 6 inches in one second or one minute.

Waters fit for Irrigation.

Water is the universal solvent, and no water except that trickling from the condenser of a distilling apparatus is absolutely pure in its natural condition.

Thus rain water, which is considered the purest of all, washes down from the air impurities which to a great extent constitute valuable plant food. In close proximity of the sea coast, for instance, 30 to 40lbs. of common salt to the acre are brought down annually by the rain. Of ammonia 2 to 10lbs., and of sulphuric acid 10 to 20lbs. are added from the same source to every acre of land in localities favoured with a fair amount of rain.

Of stream water some prove better than others when used for irrigation, and they vary according to the amount of substances they carry either in solution or in suspension.

Well water is, as a rule, even more highly mineralised than stream water, and is often injurious to vegetation, especially in the Eastern and inland districts, where it is not unfrequently unfit for consumption.

Taste is the readiest means of ascertaining whether water is fit for domestic or irrigation use.

A crystal clear well water often proves worthless for irrigation purposes, whereas a spring or a well well-stocked with aquatic plants and luxurious vegetation, and where stones at the bottom are covered with green slime, always holds water fit for irrigation.

The best indicator of the fitness of water for irrigation is the palate, and when the taste is decidedly mawkish it is advisable to have a sample analysed before going through the trouble and the cost of providing for its lifting and cost of distributing it on the ground. An analytical statement is often perplexing until the array of figures is understood.

In water analysis the residue or solid matter either held in suspension or in solution is expressed in so many grains per gallon, or so many parts in 10,000 parts. We have seen in a previous chapter when dealing with manures that the weight of one acre of agricultural soil one foot deep is approximately 3,500,000lbs. It has, moreover, been determined by chemical investigation that a soil containing ·1 per cent. of soluble salt is unsuitable for cropping, and is only fit for growing salt-loving plants.

The question, therefore, which the irrigationist has to solve is: What amount of water containing a given quantity of salt will be necessary to cause the accumulation into the ground of approximately ·1 per cent. of salt (equivalent to 3,500lbs. to one acre one feet deep).

That question, indeed, can only be approximate, as a certain proportion of that saline matter would be leached out of the ground during the rainy season; sandy soil could beside stand more salt than the more retentive soils, such as loam and clay, and drainage would also delay to some extent the period when that dangerous point of ·1 per cent. of salt would be reached. When calculating the amount of salt added to the soil by water containing a known number of grains of that substance to the gallon, it must be borne in mind that one gallon contains 7,000 grains. As 1 inch of water over 1 acre is equivalent to 22,630 gallons (101 tons) it follows that every grain of salt per gallon adds $\frac{22630}{7000} = 3\frac{1}{4}$lbs. of salt to the ground whenever that amount of water is used in irrigation.

It would be unsafe to use extensively for the purpose of irrigation a well or pond water containing more than 70 grains of salt to the gallon. Such an amount would mean an addition of about 2cwt. ($227\frac{1}{2}$lbs.) of salt to the acre, for each one-inch watering. Such a water used in the more arid regions, where rainfall is light, would soon accumulate in the surface of the ground an amount of salt which would prove injurious to vegetation, and 10 irrigations of one inch each would add to the soil over a ton of salt, which, added to the amount of that substance already in the ground, would make it sterile.

In the coastal districts, where the rainfall is more abundant, a water containing 30 grains of salt to the gallon could be used pretty freely for irrigation, provided the soil is of a light and porous nature and is well drained. But if used on stiffer soil it would, in in the course of two or three years, bring the amount of salt up to danger point.

A water containing 3 to 6 grains of common salt to the gallon is often used for all domestic purposes.

Factors which Influence Irrigation.

No cast-iron rule can be laid down regarding the amount of water necessary for obtaining the best results from a given crop.

The rainfall, the depth and nature of the soil and of the subsoil, the particular variety and age of the trees, the climate, the quantity as well as the quality of the water at command, and the means and facilities of bringing water on to the land all require consideration.

Speaking generally, a rainfall of 20 inches on deep loam fairly rich in vegetable matter and possessing good absorbing and retentive power, may prove sufficient for an orchard planted with deciduous trees, provided that amount of moisture is well tended, and by good cultivation prevented from escaping by evaporation.

Under similar circumstances, 25 inches may not be too much for evergreens, such as citrus trees, which require more water.

On deep, dry, sandy, or limestone formation, however, or on thin soil overlying solid rock, the plants would very likely show signs of distress even with a greater amount of rainfall.

Crops possess different degrees of thirst, their exigencies in this respect running approximately in the following order :—

1. Meadows and artificial pastures.
2. Maize and sorghum, for green crop.
3. Lucerne.
4. Rape and root crops.
5. Tares, oats, and peas.
6. Fruit trees.
7. Wheat and rye.
8. Grape vines.

In the course of an ordinary season, the climate and the soil of the bulk of the South-Western division of Western Australia has been proved to possess sufficient rainfall and sufficient absorbing and retentive power to supply all requirements of the last four of these groups of cultivated crops. After a dry season, however, even these more pronounced drought-resistant crops will suffer more or less, and fail to yield a full crop, except at especially favoured spots, or unless artificially watered in the proper season.

The age of trees, too, and the distance apart they are planted, influence to a very marked degree their moisture requirements. Evidence is not lacking of a number of orchards established in various parts of the country which, when young, produced crops of first-class fruit, and which as the trees became older and the space between the trees decreases with their growth, bear a class of fruit inferior in size, appearance, and flavour. In such instances watering often proves very profitable. It is simply reduced to a question of ways and means.

Methods of Irrigation

differ with the nature of the crops grown. As a rule, the method of flooding land is practised in the case of pastures,

meadows, and cereal crops, whereas either *permanent ditches* or *fresh furrows* are resorted to in watering orchards, vineyards, or crops grown in lines.

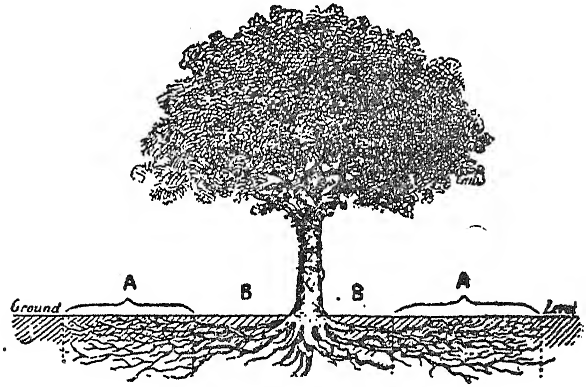
In this second case furrows are traced each side of rows running from the distributing channels down the slopes. On steep and broken slopes difficult to plough and where the soil is apt to wash, permanent ditches are laid out on gentle grades for slow running of the water, which slowly percolates from these ditches and supply moisture to the trees or crops below them. The great drawback of this system of watering land is that a considerable amount of hand-hoeing has to be done on the banks of the furrows, which, not being turned up by the plough, would soon be covered with a thick growth of weeds. For this reason, and on level country, wherever the land has been well graded and levelled, as it is the practice on most irrigation colonies, the fruit trees are watered by means of plough furrows, which are closed after each watering. Where the grade is steep, a shovelful or two of earth thrown at intervals in the channel will break the current of the water. As soon as the water has reached the lower end of the furrow, the watering may be stopped altogether and other furrows filled; or should a good soaking be required, one-half or two-thirds of the water should be cut off and smaller streams allowed to trickle a few hours longer, until the land has been sufficiently moistened. A rapid flow of water along the distributing furrows will glaze the surface and will prove an obstruction to the water soaking deeply down into the ground.

The *Supply Furrow*, which is fed from the *Main Channel*, is made to run along the highest side of the ground and supplies the water to the *Distributing Furrows*, which are made to run perpendicular to its own direction. It is easily made by running first an ordinary plough, which traces the furrow and is followed by a double mould-board or ridging-plough, which not only opens up the channel, but throws the loose earth on both sides so as to form the bank. Should a deep channel be required, this operation is repeated over again.

The *Distributing Channels* are easily traced by running an ordinary single furrow plough up and down the same furrow.

It is important that the water should not come into actual contact with the bark of the trunk, as trees which have thus been standing in water for some time are apt to develop the "collar rot," which is an exudation of sap at the root crown, and is very similar to the gum disease. Many a promising young tree has thus perished through being improperly watered. For this reason, water should not be applied to the trees in the bowl-shaped reservoirs which beginners often think is the best way of watering them; whenever water is thus applied a little mound of earth should be left as a protection round the trunk. Another reason why water should not be thus applied is that in order to be more beneficial, it should be placed within easy reach of the tender rootlets which radiate round the plant, and to which it is most beneficial. I have already called attention to the structure and disposition of the roots

of the plant round the stem, so that the reason is plain why it is more beneficial to water the plant at some distance from the trunk, where all these tender rootlets radiate, rather than close up to the plant itself.



Showing at "A" the proper place to mulch, manure, and water.

The distance of the furrow on each side varies according to the size of the trees.

For young vines a furrow on each side 18 to 24 inches away from the lines might be drawn, whereas for older vines planted 8 to 10 feet apart in a loamy soil one furrow midway between the rows is quite sufficient.

For young trees the distance from the trunk would vary from two to three feet, and if the trees are large the furrows would be opened four to six feet away from the stem.

Whether the soil is heavy or light, the method of applying water is the same, and the next day or the day after, as soon as it is sufficiently drained, the whole surface is scarified with the cultivator; or if the surface is already clean and loose, the furrows alone are broken up by means of the cultivator or scarifier, which should not be less than three feet wide, so as to take in a good strip of land.

At each subsequent irrigation the furrows are run in a different place, and thus is the land maintained into a uniform degree of moisture.

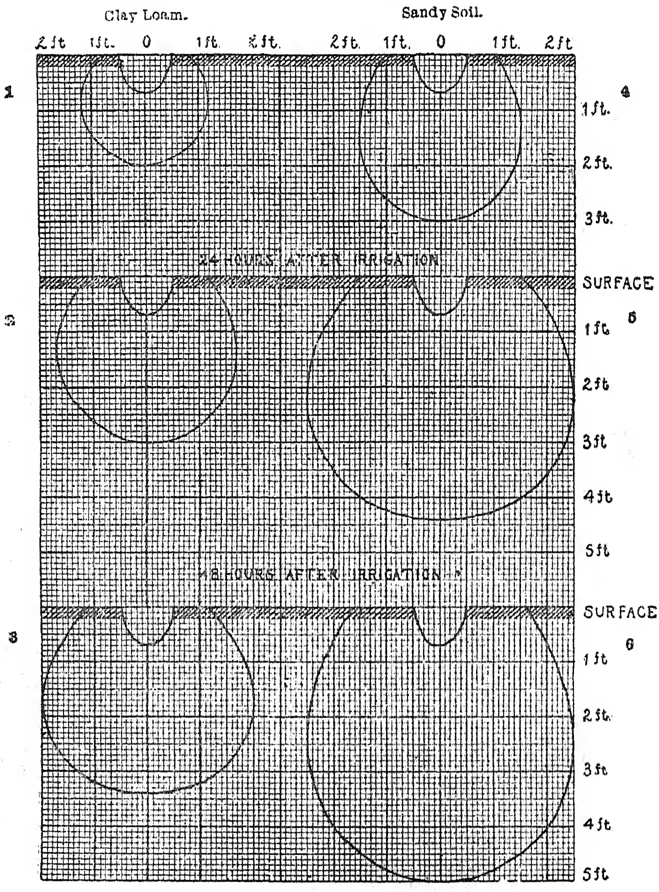
Spread of Water from Deep Furrows.

Clay and sand will absorb water at a different rate, and, having absorbed it, hold and retain it more or less loosely.

These properties have been measured at the sub-stations of the College of Agriculture of the University of California, and the following diagrams show the extent to which water from fairly deep furrows penetrates the sandy soil and the heavy loam at the sub-station.

The spread and the descent of water are carefully mapped out on these charts.

The furrows are seven inches deep, and the water was run two days of twelve hours each. Seventy-two hours after irrigation the extent of soil-saturation was measured, the sectional area showing that in clay water had wetted somewhat under sixteen square feet as against about thirty square feet in the case of the lighter, more porous soil. It is contended that a still deeper and narrower water channel in the case of the clay soil would have carried the water deeper, and would have resulted in economy in the use of water, a smaller flow producing as large an area of saturation with less surface.



Percolation experiments, showing spread of water from deep furrows in clay and sandy soils.

Cost.—It is reckoned that with one horse and plough one man can prepare ten acres for irrigation in a day at a cost of 9s., or a little under a shilling per acre. With a scarifier six feet wide and a pair of horses, one man can cultivate the same area of ground after each watering at a cost of 12s., or 1s. 2½d. per acre.

Amount of Water Required.

No hard-and-fast rule can be laid down. Local experience, as well as the general appearance of the crop, are the best guide in this matter; for instance, the amount of rainfall varies sometimes considerably even in the same seasons in different years; again one soil may be more retentive than another; or, owing to its configuration and the more or less porous and gravelly nature of its sub-soil, may either be very quickly drained or else may receive abundant moisture from the drainage of the slope above it; the varieties and age of the trees have also a direct bearing in regulating the amount of water to be applied; thus certain soil will be quite moist enough for deciduous trees, such as plums, apples, pears, and would require irrigation for citrus trees, or moist enough for young and not for bearing trees. In a very dry climate, for instance, the young orange orchard should be irrigated every three weeks at first, and then once a month during the first season by simply running one furrow at a distance of two or three feet on each side of the trees.

The second and third seasons, the trees having been well established, less irrigation will be required, and in our climate one watering every six or eight weeks will be sufficient.

By the fourth year, the trees having gradually increased in size and being in bearing, the number of furrows between each row will likewise be increased until when the trees have grown to their full size and produce heavy crops, by the tenth year, the distance between the furrows is brought to five or six feet and the time given for each watering is gradually prolonged. As a rule, orange trees in full bearing will require as much as three times the quantity of water required by the same trees during their second and third year in the orchard.

In the case of the vine, the water management also requires judgment. During the first season of planting, one or two good waterings are more than will be needed, the ground having received a good soaking previous to planting out the cuttings or the rooted plants. The second season, one early autumn and one summer watering will be found sufficient, and later on as the vines enter into bearing they should not be irrigated more than once every five or six weeks in the case of table or raisin grapes, and once every six or seven weeks in the case of wine grapes. In either case, the watering should cease when the berries have attained their full size and are ripening, or else they will burst, viz., according to localities and varieties, the beginning of December to the beginning of February. In the case of wine grapes, the last irrigation should

not be given later than the time the grapes are "turning," or otherwise the must will be watery and the wine will be thin, poor in colour, in flavour, and in keeping qualities.

Over the fruit-growing districts of this State, described in this handbook, grape vines do remarkably well without the assistance of any irrigation whatever, provided the soil is kept in a state of good cultivation.

So far as I have been able to observe, the tendency generally with fruit growers who have water laid on in their orchards is to overdo irrigation. Fruit trees more especially need to be irrigated with discrimination, or else the fruit, instead of being firm, fleshy, of good flavour, and of good keeping quality, is, on the reverse, spongy, squashy, insipid in taste and flavour, easily bruised during the course of carrying to market, and of poor keeping quality.

In planting an orchard where irrigation is contemplated, the grower should bear in mind that each variety of fruit requires watering at different times; for instance, watering with cold water when the tree is in full blossom might lead, through sudden shock, to considerable injury, and, as a consequence, reduce crop. With trees, therefore, blossoming at different times it is advisable to keep them separate; again each row should be planted with trees of the same age for reasons already discussed. Another reason is that by keeping the trees separate each sort may be treated differently, some kinds of fruit requiring more watering than others.

Practical irrigationists turn on water in the distributing channels in the afternoon, and unless the trees imperiously need it, cut it off in the morning, as during the day the soil may get so hot that should cold water be applied suddenly to the roots serious injury would ensue.

Late in the season the irrigation of fruit trees might be more injurious than beneficial, for the reason that the soil and the water beginning to cool the trees might receive a sudden shock, or they might start growing again, striking new shoots, instead of concentrating all their energy towards ripening the fruits and building up fruit buds.

One more important point, if neglected, would annul the benefits derived from irrigation.

It refers to the necessity of combining *Drainage* with irrigation. Unless the soil is naturally well drained a copious supply of water will turn it into a quagmire, which will prevent proper cultivation and at the same time injure the roots of the trees.

It may be said that wherever land is so situated that natural drainage does not exist and the cost of sub-soil drainage would exceed the value of the profits expected from the application of water on to the land, irrigation is impracticable; in fact, underground drainage may be said to remove the excess of moisture in

winter, and to tend to retain moisture in the summer months, thus making the soil, and consequently the roots, warm when the weather is cold and cool in dry and hot weather. Complete drainage and moderate moisture are as necessary to the healthy growth of the root system of the plant as pruning and spraying with insecticides to the healthy growth of the branches and leaves, and the production of a crop of sound, showy, and well-matured fruit.

AGRICULTURAL LECTURES.

By A. Despeissis.

In this issue we commence the publication of a *résumé* of a course on Agriculture, which has just been initiated at the Training College, Claremont.

The object of the lectures is primarily to impart a knowledge of the elements of agricultural practices to school teachers. With the consent of the Principal of the Training College and at the instance of the Minister for Lands, the lectures, which are delivered on Mondays from 4 to 5 o'clock, are open to anyone who may apply for permission to attend them.

Mr. A. Despeissis, the horticultural and viticultural expert of the Department of Agriculture, has been entrusted with the duty of conducting the course, which is intended to cover two years.

In opening the series of lectures, Mr. Despeissis expressed his gratification at the fact that the strain he once brought upon himself when a student at the Royal Agricultural College, Cirencester, in taking full and copious notes in the lecture rooms, is being now turned to some good account in imparting to others some of the agricultural knowledge he had acquired at Cirencester.

Agriculture may be regarded in the light of a business more than of an art or of a science, although several sciences cognate to agriculture every day and in every way help the cultivator; yet the successful farmer is the one who brings into the conduct of his business, industry, common sense, and commercial shrewdness. Capital, if not essential, is found helpful. Perhaps there are few countries in the world which offer to intending settlers the same advantages of cheap land, cheap money, reliable climate, and profitable markets as does the State of Western Australia.

Soils are described as the result of the weathering of rocks; whilst rocks is the term which denotes any large mass of earthy matter, whether hard or soft. Weathering is the name given to those powerful agencies which bring about the decay or disintegrations of rocks and reduce them into soil.

These agencies are of a physical and of a chemical nature. The dissolving action of water, the expanding force of frost, and of heat gradually burst off small particles of rocks, which are also attacked by gases and by water impregnated by acids, which, acting chemically on these particles, accelerate and accomplish their disintegration.

Soils are either known sedentary or local when resulting from the decay of underlying rocks or they are transported, and are then called drift soils.

Some 70 simple bodies or elements are known to chemists, yet of these a dozen or so enter largely into the composition of the rocks forming the earth's crust. These elements do not exist as such, are free in Nature, but are combined together, and in this state are known as "minerals."

Minerals are the result of the systematic combination in definite proportions of elements; thus one part of oxygen and two parts of silicon, which are elements, combine and form silica or oxide of silica, which is found pure in sand, etc. Two parts of hydrogen and one part of oxygen combine and form water, etc. Minerals, on the other hand, are thrown together in indefinite proportions and constitute rocks. Thus pink, grey, and black granite all contain quartz, felspar, and mica, but in different proportions. We thus have an idea how complex the composition of soils must be and how useful some knowledge of its nature must be to those engaged in its exploitation.

Truly "agriculture aims at bringing about the metamorphosis into organic matter represented by plants and by animals of the greatest possible mass of mineral elements."

To plants and animals we entrust the care of manufacturing from the raw materials supplied by the earth and the atmosphere the thousand and one articles of commercial value for which there is a demand in every part of the world.

Rocks are classified according to their modes of origin into Igneous, Aqueous, and Metamorphic rocks.

Igneous rocks, which have been produced by the agency of the earth's heat, are subdivided into volcanic and plutonic rocks. The first have been ejected from the bowels of the earth; the second have been formed under conditions of depth and pressure, and have cooled down slowly.

Volcanic rocks are represented by Basalt, Lavas, Trap rocks, etc.; Plutonic rocks by granite, felsites, syenite, etc.

Aqueous rocks have been deposited in strata in water. They have been formed either 1° mechanically as clay, sand, or 2° chemically, as rock salt, gypsum, or 3° organically by animals as coral, diatom earth, phosphatic nodules, or by plants, peat, coal, ironstone. Metamorphic rocks occupy an intermediate class, and are the result of great heat due by the intrusion of volcanic dykes upon aqueous rocks. Thus sandstone has been converted into quartzite, clay into slate, limestone into marble.

SECOND LECTURE.

Classification of Soils from an Agricultural Standpoint.

In the first year of the creation the earth must have been a mass with rough outlines of rocks; time alone, which is the great leveller, having seen the wasting down of the hills and the filling up of the hollows.

The soil from an agricultural standpoint may be said to consist of two kinds, namely, surface and subsoils.

Surface soil is always found on the top, forming a superficial bed in which all the ordinary tillage operations such as ploughing, etc., are carried on. Owing to manures and the decay of animal and vegetable life, it contains organic matters, and is usually of a darker colour and also richer in fertilising power than the subsoil. On an average its depth is from 9 to 12 inches, although at times it is found to go to a depth of from 9 to 12 feet in deep alluvial tracts. The surface soil affords a root-hold for plants, as well as supplying moisture, air, congenial temperature, and, together with the assistance of teeming myriads of friendly micro-organisms, it keeps plants thriving and healthy. It also acts as a storehouse from which rations of plant food are drawn by the growing crops.

Subsoil is found underlying the top or surface soil, which in some cases it closely resembles, although of a lighter and sometimes of a totally different colour.

The office of each soil is equally important, and they should both work harmoniously together, for crops cannot grow on rocks, no matter how well stocked in plant food it may be.

Soils are composed of two great divisions of materials, and contain—

1. Mineral matter.
2. Organic matter.

The first represent soil derived from aqueous or igneous rocks. The second is composed of accumulations of vegetable or animal matter, as exemplified by peat or bogsoil. They are more or less rich in proportion to the organic matter they contain, and that organic matter forms a necessary condition of our fertile soils.

In order that a soil may be productive, it must have mechanical or physical, chemical, and biological properties. The classification of soils varies according to these characters.

Density of Soil.—The practical value of the soil is influenced by its physical properties, and one of the first of these conditions which arrests our attention is the variation in weight or the comparative density of soil.

Sand weighs when dry about 110lbs. per cubic foot, and peat 30 to 50 lbs.; in between come loam and clay.

If, therefore, we take a slice of one acre of soil one foot deep it, would weigh, if sand, 4,791,600lbs., or, if peat, 2,178,000lbs.

For ordinary purposes of calculation, it is assumed that one acre of agricultural land one foot deep weighs 3,500,000lbs. So that 1 per cent. of a substance in such an acre of land weighs 35,000lbs., while ·1 per cent. weighs 3,500lbs.

A distinction must be made, however, between the weight of the soil and the meaning which is commonly attached to the terms "heavy" and "light" soils. Sand, for instance, is considered light soil, and yet for a given bulk it weighs heavier than any of the others. Clay soils, on the contrary, are called heavy soils, though they are lighter than sandy soils. The fact is that the terms "heavy" and "light" as applied to soils, refer to the horsepower required to cultivate them, and not to their actual weight.

Contraction.—Another feature of soils is the contraction on drying which clayey and peaty soils possess. Peat shrinks one-fifth or 20 per cent. of its bulk, and clay shrinks one-sixth or 16 per cent. of its bulk; whilst sand will not contract at all. For this reason it is necessary when requiring to strike vine or other cuttings in clayey soil to place sand round them, so that the ground when it dries up will not shrink away from the plant; crops are also harrowed well in dry weather in order to prevent the soil from shrinking away and tearing the young roots in so doing.

Absorption of Moisture.—Water is needed for two purposes—first, to dissolve plant food in the soil and enable it to penetrate the plant; secondly, to build up the tissues of the plant and, by transpiration, create circulation of the sap. Lack of moisture is generally responsible for failure of crops.

Soils vary in their power of absorbing moisture from the atmosphere; and that power increases with the fineness of its particles. Sand absorbs the least, while peaty soil absorbs the most. The water in the soil may be of three forms: "Free or hydroscopic," "capillary," and "hygroscopic water." Free or hydroscopic water obeys the laws of gravity. Capillary water adheres to the soil particles, and is due to the attraction of matter for matter; it ascends, descends, or moves laterally through capillary tubes. It is this moisture that it is meant to save by means of cultivation. Hygroscopic water is that film of moisture which is held more tenaciously and does not run into drops like free water, or does not move from particle to particle like capillary water. It requires a warm temperature before it is driven off. It is that moisture that is contained in iron rust, in gypsum, and in clay, etc. The finer the ground is cultivated the better it absorbs the water. Soil that is lumpy and full of clods presents less feeding surface to roots and contains less capillary water than an equivalent amount of well-pulverised soil. This is illustrated by florists, who are able to grow fine plants in a small flower-pot by using only well-pulverised and sifted soil. The same plant would require five or six times the amount of room if planted in the open, and then possibly not thrive so well.

Thus by careful and thorough tillage one acre of land may be made to produce as much as four or five acres indifferently cultivated. It has truly been said that success in modern farming depends more on the size of the farmer than that of the farm.

Retentive Power of the Soil.—Another property is the capability of retaining moisture. It is lowest in soil and highest in peat. Sandy soils give off their moisture in one-third of the time of that of clay, mould, or loam. The retentive power is increased with the addition of organic matter; hence the advisability of ploughing in green crops where the land is poor in humus. Good tillage, by preventing the absorbed water from being lost by evaporation, helps to conserve it in the soil.

Absorption of Heat.—Another capability of soils is their power of absorbing heat. This depends upon the colour; the darker the soil the more heat is absorbed. The more water a soil contains, the slower will heat be absorbed. Gardeners in Europe place soot and coal dust around their early cucumbers and other plants to force the ripening of the fruit.

Absorption of Gas.—Soil also absorbs gas, which is necessary for the growth of the plant. Soil well open will absorb gas more readily than compact soils. Drainage, by lowering the water table, will also permit of the penetration of gases. Seeds require a great deal of oxygen when germinating, hence they should not be sown too deeply. Plants that get their roots covered by water are soon asphyxiated by being unable to absorb oxygen through their roots.

Tenacity.—The tenacity of soils is mainly due to clay and very finely divided particles of soil. It takes three times the horsepower to plough one acre of stiff, fine clay as to plough one acre of friable, arable land.

Chemical Composition of Soil.—We have seen that soils are composed of two great divisions of material, and contain:—

1. Inorganic or mineral or fixed matter.
2. Organic or volatile matter.

A very large proportion of these mineral matters are inert, and serve as a foundation over which the crop's structure rises. It is mostly passive. A very small proportion only is active, and varies from one to four per cent. of the whole mass. The combined action of these two groups is therefore that of holding, storing, and conveying the plant food to the crops, and also of elaborating and preparing that plant food.

Plant Food.—Plant food is composed of a little more than a dozen ingredients. Chief amongst these are nitrogen, potash, phosphoric acid. These are the only three which are more commonly deficient in soil, or, if present, they are tied up in combinations which are inert and not readily assimilable by the plant. For that reason these three are added to the soil in fertilizers. Most of the other elements of plant food are found in the soils in sufficient quantities for the requirements.

They are made up of two distinct classes of substances—one which constitutes *bases*, and the other *acids*. By means of chemical combinations, these bases and these acids elaborate substances chemically known as *salts*. Some of these salts are soluble in water, and others are not; some are soluble in slightly acidulated water, such as is found around the tender rootlets of plants, and these are enabled to enter the tissues and take their part in their construction.

THIRD LECTURE.

Biological Properties of Soil.—A soil to be fertile must not only possess "good texture" and the requisite "chemical composition," but must also be possessed of "life." A well cultivated, fertile soil is teeming with micro-organisms, also called germs, microbes, and bacteria. These beings are uni-cellular bodies, generally classified with plants, and whose functions is to chew up and digest, as it were, the food of plants and make it available.

We could go on dumping costly fertilisers on to a piece of ground without making it in the least fertile, if we neglect the precaution of preparing it to receive those friendly micro-organisms which assist in breaking down the soil particles and transforming them into plant food. It can be seen, therefore, that the first concern of the cultivator is to see that his soil is reduced to the proper texture. This will facilitate tillage operations, extend the feeding ground of the plants, assist the duty of fertilisers, and promote the well-being and the comfort of those micro-organisms which galvanise the inert earth into a field of life and activity.

Nitrification.—Prominent amongst these micro-organisms are the "bacteria of nitrification," which were only discovered and isolated some 12 to 15 years ago. Of these, two species are known, one which oxidises nitrogen into nitrites, and the other further oxidises nitrites into nitrates; this combining with lime or some other bases (potash) in the soil, forms nitrate of lime or of potash, in which state the plant can absorb the nitrogen. This nitrification takes place near the surface, where the soil is generally sweet, warm, well aerated, and well drained. In free soil it takes place to a greater depth. Decayed roots and drainage, by permitting air to penetrate deeper down into the soil, and purging it of any excess of water or of noxious substances such as common salt, carbonate of soda, and ferrous oxide, promote nitrification to a greater depth. In good agricultural land that is allowed to lay in bare fallow, some 25 or 30 per cent. of nitrates are lost in the drainage water, hence the value of sowing a catch crop which feed on them and hold them.

These bacteria are of a class known as "aerobies," which requires air and oxygen for their existence. Another class of bacteria called "anaerobies," which act quite the reverse way, are also known; they

reduce nitrates in the soil into nitrites. They do not take the oxygen they require directly from the air, but rob the higher oxidised substances of some of their store. These bacteria are common in water-logged soils from which the air is excluded by stagnant water; they are also found in marshes.

NITROGEN-FIXING BACTERIA.—Other bacteria are known which only work in the presence of the wart-like growth on the roots of leguminous plants. Both this class of plants and these bacteria, working and living together, possess the power of drawing the nitrogen they require direct from the air and of fixing it in their tissues in a state which can be utilised by plants. This appropriation of nitrogen takes place under conditions of porosity, moisture, and warmth, found most suitable for nitrification.

The plants of the leguminous families, it is well known, can thrive without the application of nitrogenous manures. This fact has only of late been demonstrated, and not until thousands of pounds worth of nitrogenous manures had been, as it were, wasted on them. They require a starter, however, and seedling peas, for instance, will not do well for a few days unless some nitrogen in the form of assimilable nitrates is present in the ground; but once these wart-like nodules begin to grow on the roots, these seedlings are seen to thrive even without nitrogenous manures, provided the soil is otherwise well provided with phosphates, potash, and the other essential elements of plant food, in an available form. Such crops after removal leave the ground even more richer in nitrogen than it was before.

Each leguminous plant possesses a bacterium which has a special affinity for it.

Some of these have been isolated; and cultures of them are now made, and found in commerce under the name of "nitragin." It is premature yet to pronounce definitely on the virtues of these cultures.

DISINTEGRATING MICRO-ORGANISMS.—Other micro-organisms are known to exist in the soil in teeming legions. Their action is not a constructive, but a destructive one; they disintegrate and return to the soil and the air what has been borrowed from them for the purpose of building up the tissues of plants and of animals. Amongst them are the micro-organisms of putrefaction.

EARTHWORMS also play an important part in disintegrating and enriching arable soils. They bring up to the surface constituents of the deeper layers. Their castings consist of triturated earth and vegetable mould, and are, therefore, rich in readily available plant food. These castings, when they accumulate to some considerable amount, at times become slimy when pot plants are watered, and thus clog the earth; but this condition can easily be corrected by the occasional use of some lime water. Their burrows also convey deep down through the mass of the soil, both atmospheric air and rain water, which attack and dissolve the

mineral ingredients of the soil, and convert them into soluble plant food.

White ants, in the more arid regions, to a small extent, do what earthworms accomplish in moister localities.

Available Plant Food.—A fertile soil must have good texture, must contain a sufficiency of elements and substances which are essential to plants, and must be well stocked with those micro-organisms which have already been reviewed. Another essential condition is that those 12 or 13 essential elements of plant food which constitute the "bill of fare" of a crop, must be prepared and dished up in some sort of digestible form. Some of these substances, which may not be soluble in rain-water, are soluble in soil-water, which contains various acids. They must also not only be soluble, but they must be in such a form that plants will not refuse to take them. Nitrogen, for instance, is not available as such, or even as ammonia, but it must be offered to the roots of the crop as a nitrate, such as nitrate of lime or as nitrate of potash commonly known as saltpetre. Phosphorus must be presented not as such, but as a phosphate of lime of iron or of alumina. Even amongst phosphates, some are susceptible of being used up as plant food, whereas others are not.

It then becomes a question whether, when a soil is not well supplied with available plant food, it is possible by means of cultivation to "unlock" that plant food from its non-available form, or whether it is preferable to add it to the soil in the shape of fertilisers.

Exhaustion and impoverishment are the sequel of continuous cropping and of bad farming. The available plant food in a soil is somewhat limited; and the unremittent growing of the same crop, feeding on the same depth of soil, and removing periodically the same elements of plant food, soon deplete the ground of its store of one or more of the elements of available plant food it holds.

As the weakest link is the measure of the strength of the chain, so the depletion of one or more of these elements is the cause of land being "run out."

Loss of fertility is also at times due to the fouling of the ground after many years' continuous occupancy by the same tribes of micro-organisms. Such an instance is found in fields which become "clover sick."

Barrenness is another term used in speaking of land which fails to yield profitable crops. The causes of barrenness are permanent, as when a very thin layer of soil covers a ledge of rocks; or temporary, as occurs in cases which are susceptible of improvements by means of drainage and of irrigation.

(*To be continued.*)

NOTES ON THE HARVEY DISTRICT.

By A. C. Vaughan.

When we get far advanced enough in history for our different districts to be noted for any particular thing, the Harvey will be noted for its oranges.

The Harvey estate is a wonderfully rich estate, and the proprietors have recognised the suitability for close settlement in cutting it up into holdings of from 10 to 250-acre blocks. Climate rainfall, and soil are all that can be wished for, and settlers can grow pretty well anything they wish. Fruit, especially the citrus family, growing to perfection; but all trees and vines do well; at present citrus trees and potatoes are the two crops that are grown most. This is the first district in which I have seen a potato planter at work, and the settlers round are so pleased with it, that the owner of the machine is kept busy after he has planted his own crop, planting other peoples, or else letting them the machine. Over 100 acres of citrus are planted, oranges predominating, besides deciduous trees; all the trees look well and have every chance of producing good crops and living to a good age, which is more than can be said of a great many trees that are planted. Fully twenty families are settled on the estate, all satisfied with their prospects, and there is plenty of room for many more; anyone can see from this the value that fruit-growing is to a country, an industry, if any, that should be encouraged to the utmost limit. The long time it requires to bring a plantation into successful bearing, and the more or less uncertain market there may be when crops are ripe make it hard for even the smartest man to gauge the value of what a crop will be worth four or more years hence. An acre of fruit trees has sold for £100, and many for a great deal more. The fruit-grower puts more value on an acre of land than most cultivators, and it must be better for a State to have 100 acres of fruit trees than 500 acres of cereals, as that 100 acres of trees will employ five times the number of men, and represent five times the value of that of ordinary farm land. I very much doubt if up to the present fruit-growing has, so far, brought in any way near the money that it has cost to produce. An industry that this country is so well adapted to, yet takes so much capital, patience, perseverance, and foresight, and improves the value of the land to such a great extent and would make healthy employment for thousands, and add in every way to the wealth of country, should have every encouragement a Government can give, and members should wake up to the duty before them in making the country progress as rapidly as possible, as really it is only a matter of time; but the present generation is an impatient one, and we want to see the country progress rapidly, and if we can induce capital to come into the country we shall progress rapidly. The essential thing is to show capital that we can guarantee a fair

interest with good security. It is a standing disgrace, and reflects on the Government, that with a country like we have here—with soil, climate, and rainfall in our favour—we still go on importing instead of, as we ought to be, exporting food stuffs, and the more you see of the country the more you feel this. The fault does not lie with the man on the land, as he would quickly alter the state of affairs, but he is crippled for want of capital. The fault lies with the state of the money market. If we could get money as easily as gold mines, tram-car companies, syndicates for building town blocks, etc., food would soon be cheap and the country prosperous. Having so far digressed, I will now return to the Harvey district. This district is particularly fortunate in having for settlers many men with wide experience. This means a lot to a district, as management and knowledge are two essential qualities for success, and successful properties encourages settlement.

Messrs. Newell and Christisson have a fine young orchard coming on. Ten acres of oranges and ten acres of apricots and peaches have been planted about three years, and more land is being rapidly cleared. Mr. Newell has had a very wide experience of horticulture, and the consequence is that the trees are well pruned, cultivated, free from disease, and looking the very picture of health. Mr. Christisson manages the homestead, as the proprietors (Drs. Harvey and Hayward), retain a certain amount of land, which they cultivate and stock. Messrs. Ash and Oscar Rath both have fine orchards coming on, and have gone in mostly for citrus trees.

In a closely-settled district like this, the keeping down of fungus and insect pests is most important. At present only two scale insects are causing trouble in the newer orchards (the red scale only existing in the older and isolated orchards), the black scale (*Lecanium oleæ*) and the soft or broad scale (*Lecanium hesperidum*), and there is no reason, with our present knowledge, why any other pest should be allowed to come in. Regulations cannot be too strict for the prevention and the spread of disease. It will add pounds and pounds to the value of the fruit-growing industry if our orchards are kept clean. The *Lecanium oleæ* and *Lecanium hesperidum* are the only two scales that have got established, and there is no doubt that these can be kept down, or even eradicated by parasites, when we can establish them. The parasites Mr. Compere, the Government entomologist, has sent over, the common *Orcus Australasiæ* ladybird, is doing splendid work in keeping down these scales. I also found in Mr. Ash's orchard a specimen of *Halzia Mellyi*, a ladybird which Mr. Lee sent over from Tasmania, which no doubt when it gets established will do a lot of good. Growers must not think that these predaceous insects will relieve them of all responsibility in keeping their orchard clean, as where you find a lot of parasites there must be a lot of food for them to live on. You do not want to breed scale for the parasite, as sometimes the scale will do a lot of damage before the parasites will be properly established. Parasites will be particularly useful in cleaning infested areas of old trees, especially evergreens or trees in foliage, as anyone can see

that spraying can only kill were it hits, and that it is almost impossible to hit all scales on big trees, especially those with thick foliage. Anyhow, there is no doubt that the majority of growers who have scaly citrus trees of any size have not been successful in cleaning them. It may be, no doubt, that they have not thinned the trees out enough, or have not had a powerful enough spray, or the mixture has not been properly made; but the fact remains that the big citrus and evergreen trees have not been cleaned by spraying, and therefore it is important to get parasites established as soon as possible, as growers are constantly asking for them. It must not be thought from this that spraying can be done away with, as every time it will be found cheaper and necessary if a man has small trees infested to spray at once, as these can be easily cleaned; in fact, half the trouble arises from growers being careless or ignorant at the start. People are not careful enough in watching their trees to see if they have completely destroyed every scale they find after spraying, looking over the trees roughly that they have destroyed a big percentage of scale and are satisfied, and perhaps never go near the tree again for months, and so it goes on until they find the pest has got all over the orchard.

ENTOMOLOGIST'S REPORT.

INTRODUCTION OF PARASITES.

By G. Compere.

Mr. George Compere has supplied the Director of Agriculture with a report as to what has been accomplished by the Department during the past six months in the matter of introducing into this State parasitic and predaceous insects, which prey upon noxious forms which have become pests here, and also with reference to some other pests which have become established here, and which it is considered there should be no delay in securing the parasites of.

The report states:—"There was no need to study the habits of the beneficial species secured during my recent visit to the Eastern States. That had been done during a previous visit there, while in the employment of the State Government of California, on a similar mission, and a complete report of which will shortly be published by that State. I am sorry, however, to report that, owing to the unusually severe drought in the regions where the grasshopper or locust parasites are to be obtained, no locusts from which to breed them could be found. Otherwise all other species of beneficial insects of which I was in quest in the adjoining States was secured.

"Mealy bugs (*Dactylopius adonidum*).—This destructive insect in recent years, no doubt through commercial channels, found its way into this State, where it soon established itself as a pest. Having such a wide range of food plants, it is, as has been found in other countries, a very difficult pest to handle by artificial methods. For the destruction of this pest the ladybird (*Cryptolæmus montrouzieri*), the larvæ of which feed upon this, as well as other species of mealy bugs, was introduced. This valuable ladybird first came into prominence by being introduced to the Hawaiian Islands, where it rid the sugar plantations of mealy bug. It also holds these pests in subjection in the Eastern States. Very few persons in this State, however, will realise the value of the introduction of this ladybird, as the mealy bug has not as yet spread to the larger orchards and vineyards.

"Black Scale (*Lecanium oleæ*).—This scale has become well-established in this State, not only infesting the domestic plants and trees, but also various species of native plants, and is frequently met with in the bush. The results following the attacks of this pest upon fruit trees and plants have so often in the past been described by various writers that there is no need of doing so at this time. For the destruction of this scale five species of parasites were introduced, *Dilophogaster californica, Hemencyotus crawii, Myiocnema comperei*, and two species which are as yet unnamed. The first two mentioned are parasites upon the eggs of the scale, while the last three are parasites upon the scale itself, and destroy it before they reproduce their kind. One of these species hold this pest in complete subjection in Queensland.

"Soft Brown Scale (*Lecanium hesperidum*).—For the destruction of this pest two species of parasites, which are as yet unnamed, have been introduced. These cope with this scale in some of the Eastern States.

"The Diamond Back Cabbage Moth (*Plutella cruciferarum*).—Two species of parasites which destroy the cocoons of this pest have been introduced. The growers of cabbage and cauliflower in this State know only too well the amount of damage this has caused them in the past. Neither of these parasites is yet named.

"On the cabbage aphis, also, two unnamed species of parasites were sent over. In addition to the above-mentioned parasites, there were several species of predaceous ladybirds introduced, amongst which were *Orcus lafartei and Orcus chalybeus*, both of which in the larvæ stage feed upon the young of various species of scale insects. These valuable little beetles are themselves destroyed by parasites to a great extent in their native home while yet in the pupa stage. While they have been known to rid whole trees of the red scale at times, yet they are not to be relied upon to hold that pest in anything like subjection. However, they feed upon scale pests, and are, therefore, very useful insects.

"Several species of aphis-feeding ladybirds were also sent over, amongst which the two most valuable were *Verania lineola* and

Platyomus lividigaster. Of the latter only a few specimens were secured, they being so heavily parasitised in the pupa stage. A few specimens of these, which were imported to the Hawaiian Islands a few years ago, multiplied to such an extent that a few months after being liberated millions could have been collected, feeding upon all forms of aphis. Yet in their native home they are seldom met with; indeed, very few collectors ever see them.

"All of the above-mentioned beneficial insects were carefully picked and forwarded to the Department here. They arrived in good condition, and were properly cared for, and liberated by your horticultural and viticultural expert, Mr. Despeissis, who takes a deep interest in this method of combating our orchard and garden pests. There are other orchard pests which have gained a foothold in this State which we have not as yet secured the natural enemies of. Amongst these are the red scale (*Aspidiotus aurantii*), San José scale (*Aspidiotus perniciosus*), the grape scale (*Lecanium cymbiform*), and fruit-fly (*Ceratitis capitata*). The parasite of the red scale is to be secured in China, while that of the San José scale is to be found in Japan. Both of these two last-mentioned scales have proved very serious pests in various countries where they have became established, and combatting them with artificial methods has proved a heavy and perpetual tax, both upon growers and Governments.

"Fruit Fly.—With the presence of this pernicious pest in this State, the cultivation for profit of most varieties of fruits will sooner or later have to be abandoned, as, owing to the nature of attacking the fruit, it is impossible to check its spread by artificial means, as may be done with other forms of pests. The wide range of fruits attacked by it makes even the starving-out process of removing all fruit from trees in districts where the fly is known to occur of little use, as it not only confines its attention to the domestic fruits, but attack various species of wild fruits, and has even been reared from the fruit of the prickly pear (*Opuntia sp.*) in Cape Colony, where it has also become a notorious pest. All efforts on the part of the Government there to check its spread have proved useless, so far as the records at hand show. In Bermuda, since the year 1866, the peach crop has annually been destroyed, and many orchards have been cut down owing to its presence there. The pest is also known to occur in the East Indies and various parts of the Mediterranean regions. It also is found in some of the other Australian States. Just what country this fly is indigenous to is at present unknown, but no time should be lost in tracing out its home, and then there will be no trouble in securing its natural enemies.

"Another matter of great importance which should receive the attention of the Department during the search for the natural enemies of the fruit-fly is the introduction of the wild Capri fig. The introduction of this fig into the State will make it possible to successfully grow the Smyrna fig of commerce. When the Capri fig has become established, then the fig insect (*Blastophaga grossorum*) could, as has been done in California, be introduced, as

without these insects, the Smyrna fig cannot be successfully cultivated, the insects being necessary for fertilisation, or, in other words, to carry sufficient pollen from the male flowers of the wild Capri figs to fertilise the female of the cultivated ones. The fig is very peculiarly constructed, and, unlike other fruits, does not begin life as flowers, but springs directly from the axils of the leaves, button-like in appearance, in which are enclosed a large number of small flowerets. There is thus not the same opportunity of the pollen being carried by wind or bees, as is the case with other fruits and flowers."

[Mr. Compere left this State on the 3rd inst. for China and Japan, where he hopes to secure the parasite of the red scale and other beneficial insects. From there he will proceed to Washington in order to locate the home of the parasite of the Fruit Fly.—Ed. *Journal.*]

MILK FEVER IN COWS.

Symptoms and Treatment of this common Disease.

The *Massachusetts Ploughman* states :—"There are many cows lost each year from milk fever, and the worst feature about it is that it is apt to be the very best cows in the herd; that is, those best for milk production. It may be that in some cases it is caused by over-feeding, especially during the period that they go dry before calving. We do not remember ever having seen or heard of a case where it happened to a heifer dropping her first calf. Possibly drying off too early or rapidly may cause it in some cases, or a neglect to draw the milk if the udder fills before calving, thus creating a fever by the absorption of the milk into the system. It seldom occurs to cows not let go dry at all or are continuous milkers.

"It usually begins about the second or third day after the calf is born, and the first symptom is usually a chill and a nervous twitching of the head and ears. Then comes the stage when the animal refuses to eat, and the secretions of milk are lessened, and the bowels constipated, after which the cow is down and refuses to stand up. If it gets to this stage there is little chance of saving the life, though we have done so by the giving of doses of one pound of salts in which was put an ounce of Jamaica ginger, or perhaps a gill of whisky or rum, then injections of warm soapsuds until there was a movement of the bowels.

"This may be better as a treatment for preventing it if given a day or two before she calves. Other preventatives are not to feed too highly just before or after calving. Give some moderate exercise, and avoid cold winds or rains, heavy drinks of very cold water, or

allowing the cow to lie down in a very cold place. It may be constitutional weakness in some cows, due perhaps to close breeding, too high feeding of the mother, or lack of exercise. It sometimes seems to be an epidemic, and attacks almost every cow in the herd, yet in such cases we should look rather to find some common cause to the treatment of the whole than to it being contagious.

The treatment by cold-water cure has been recommended by some—that is, wrapping her body in a wet sheet, then covering this with two or three woollen blankets and a rubber blanket if at hand. This should start a perspiration in fifteen or twenty minutes, and, if it does not, repeat it. To move the bowels, take one ounce nux vomica, 16 to 18 ounces glauber or epsom salts, $4\frac{1}{2}$ ounces common table salt, and boil for ten minutes in two quarts of water; then give a pint once an hour. With this should go the injection of warm soapsuds, taking care to see that she can swallow by trying with a little water first.

Another remedy recommended by some veterinarians, especially if the animal is so nearly paralysed as to have difficulty in swallowing, is a hypodermic injection of esorine or ergotine. The esorine at one to two grains in water enough to dissolve; the ergotine twenty to thirty grains in as much water as will dissolve, or two and a half ounces fluid extract; which may be repeated in twelve hours. The esorine need not be given but once, as if it fails to act the bowels are paralysed.

While by this treatment those cases that are detected in the early stages can usually be cured, it is almost hopeless when the animals have reached that condition of paralysis when they cannot stand on their feet when lifted up, and every dairyman should not only use the methods of prevention which we have given above, but should keep a close watch for the early symptoms of the disease for at least four days, and it will be six days before it will be prudent to give a large amount of hearty or milk-producing foods. Even at that period increases of food should be made gradually for those that are liberal feeders. Those who give but four or five pounds per day of grain need not be so cautious, because almost any milch cow of fair size should be able to digest that when her calf is a week old, and three weeks later most of them could digest twice that amount.

After the cows have shown signs of recovery they will need careful watching to see that they do not take cold or do not suffer from indigestion to bring on a relapse. They should be stabled every night, and, unless the weather has become warm, they should be blanketed and not allowed out in cold storms or to stand in cold winds. We have a doubt whether this disease is hereditary, though the possible weakening from it may cause a weakening of the system of the calf that will amount to a predisposition to the fever, and perhaps to other diseases; but we are sure that until the cow has entirely recovered from the effects, the milk is not fit to be used as food for human beings, calves, or young pigs.

FARMING AROUND MECKERING.

By G. Buchanan.

One of the most interesting features of agricultural settlement in this State during recent years is the utilisation of areas which were formerly regarded as outside the region of cultivation. It is only within very recent years that the possibility of successfully cropping the heavy salmon gum forest land has been proved, with the result that a large area of land once considered of little value has now become a factor of considerable importance in the production of wheat and hay. Had anyone ventured the prophecy ten years ago that the Meckering district would become a prosperous and progressive agricultural settlement, he would probably have been regarded as little less than a lunatic. And yet to-day there are not many localities which can show an amount of work equal to what has been done in Meckering during the past six or seven years; and it is equally questionable whether any other district has given its settlers more satisfactory monetary returns for the labour and capital expended. Being on the highway to the Eastern goldfields, the settlers have benefited somewhat by their comparative proximity to their market, and a consequent advantage in freight; but apart from any purely local advantage of this kind, the results obtained in this district compare most favourably with other localities which may be blessed with better soil and a heavier rainfall. Situated 23 miles East of Northam, Meckering approaches the dry country of the interior, and the rainy season is usually of but short duration. The average fall of rain in this district is given as 14 inches, but last season rather less than 13 inches were registered; while for the present season, up to and including the first week of October, only 7 inches and 67 points have fallen. Another circumstance which promised to render the crops in this district a failure was the almost total absence of rain during August, in which month only 30 points fell. As hay-cutting usually commences in this locality in the last week of September, it will be understood that the lack of rain in August had a very serious effect in retarding the crops. However, the good showers during September wrought a wonderful change for the better.

The character of the soil in the Meckering district is similar to that found in most of the dry districts, and may be divided into two classes, which are usually described locally as "forest" and "light" land respectively. These two classes are widely different, however. The forest land—so called on account of the heavy growth of salmon gum, and in some places York gum and morrel timber on it—is of a strong heavy character, while the light soil, as its name implies, is of a loose, sandy nature, and is usually timbered with jam and other small trees. Neither of these soils presents a particularly attractive appearance to the untrained eye in their natural state, the forest land is quite devoid of any semblance of

grass until the trees have been killed, and though the light soil grows a little grass it is mostly of the kind known as "pin" grass, which, with the generally hungry appearance of the soil itself, is not calculated to favourably impress anyone who is unaware of what these soils have been proved capable of producing under intelligent cultivation. As, however, the farmer requires the land for the purpose of making a living out of it, and not merely to please the eye, he should not be discouraged by its unattractive appearance when it is proved it can be profitably cultivated.

Though there is a great difference in the quality of the "forest" and "light" soils, each has advantages which the other lacks. The forest land is certainly the richer, and, under ordinary and favourable conditions of rainfall, yields by far the heavier crops. Even without manure some exceptionally fine crops have been obtained from land of this class during recent years. One farmer in this district two seasons ago, took 170 tons of hay off 100 acres of new forest land, which had been fallowed, but was put in without manure. The light soil on the other hand will not give a satisfactory return without the addition of fertilisers, but possesses the advantage of being less injuriously affected by lack of moisture and gives better results than the heavy soil in dry seasons. This season the crops on the light soil are noticeably superior to those on the forest land, although the latter appears to have made a more vigorous start, an advantage which is not being maintained now the crops are nearing maturity. As these two classes of soil are pretty well intermixed, it usually happens the farmer has a quantity of each under cultivation, so that provision is made for any kind of season.

During the past six or seven years there has probably been something like 15,000 acres of land cleared and brought under cultivation in the Meckering district, and this area is being considerably added to each year. Apart from the value of the produce grown from this area, the actual money value added to the land by the hand of the cultivator represents a large sum, for improved farm land has recently been sold in this locality up to £4 per acre, while the same land a few years ago was considered dear enough at the price charged by the Government. It should be understood that the increased value is not to any degree attributable to the expenditure of outside capital on the land. In most cases the cultivator has procured his capital from the land as he went along.

Though most of the land now under cultivation was originally somewhat heavily timbered, clearing has generally been done very cheaply. The timber in the dry districts burns readily, and therefore does not entail the labour and expense that has to be incurred where jarrah and blackbutt have to be dealt with. At the present time heavy forest land in the Meckering district can be cleared ready for the plough for about 25s. per acre. That is, all the timber is removed from the surface, for very rarely are any of the trees left standing to interfere with the working of cultivating or harvesting implements. As stump-jump ploughs only are used, very little

attention is given to removing anything below the surface, and clearing contracts now usually specify the removal of stumps to a depth of three inches only, for it is found that thorough grubbing practically doubles the cost of clearing. In some cases the trees have been cut down level with the ground, but this style of clearing is now out of date as the stumps are found to interfere too much with the cultivating implements.

In the actual cultivation of the soil there cannot be said to be any uniform method of procedure adopted in this district. The aim of the settlers in the past has been to get in as much crop as possible, in order to obtain the fullest possible benefit from the good prices which have been ruling for produce generally. In following this course, thorough cultivation has often had to give place to expediency, and considerable areas are each season put in with no better preparation than the scarifying of the soil, this method of cultivation has nothing to commend it except that it allows a larger area to be put in than could be done if the land were ploughed before seeding. In good seasons fairly good returns have been obtained from this style of farming, but with the advent of a dry season like the present these "scratched-in" crops will give a very poor yield. Another serious objection to this method of cultivation is the fact that land treated in this way soon becomes "dirty" to such an extent that the weeds and grass ultimately choke the corn.

The benefit of fallowing and thorough cultivation generally are fully realised, and now that most farmers have considerable areas cleared, the practice of fallowing is likely to be more largely adopted. With a very short rainy season, early sowing is essential to enable the crops to obtain the full advantage of all the rain that falls, and it is only on the fallowed land that the seed can be got in to get the first rains, as the ground is far too hard to be ploughed until softened by the rain. Notwithstanding the fact that the fallow land is generally handicapped through the seed being sown while the ground is dry, thus allowing a percentage of it to perish should it remain long in the ground before started by the rain, the crops on the land that has been fallowed are invariably the best. Some experienced farmers estimate the difference in favour of the fallowed land to be from 5 to 8cwt. of hay per acre in good seasons, and the advantage would be even greater in dry seasons like the present.

Wheat is practically the only crop grown in this district, and the crop being almost invariably cut for hay, the aim of the cultivator is to produce as heavy a bulk as possible. As before mentioned, early sowing is practised to as great an extent as the cultivation of the soil will permit; in addition, the early quick-growing wheats are those principally grown. The hay harvest usually commences in this district in the last week in September, and the possession of an early wheat, which can be placed on the market by the middle of October, has, in the past, enabled some of the Meckering farmers to quit much of their new season's chaff

advantageously, when stocks of old chaff have been short. But apart from this purely temporary advantage, the early wheats naturally give much better results than the slower growing varieties, which hold on into the drier weather. The Steinwedel is the favourite wheat in this locality, though Sullivan's early is also coming into favour. Both these kinds grow quickly and give a heavy yield of hay in good seasons, though the quality of the chaff is not equal to that made from most of the later kinds. When grown for grain the Steinwedel has the disadvantage of "shaking out," a good deal of grain being lost in this way, but as only a small percentage of the crop in this locality is harvested for grain this defect is not noticed. Among other wheats which have been tried is King's early, a variety which is ready to harvest some time before Steinwedel. Great expectations were formed of this kind, but it is found that while it may be harvested earlier, it takes much longer to dry ready for chaffing, and, being a bearded variety, the chaff is not regarded with favour by chaff buyers. The beard is also an objection where the crop is grown for grain, as it adds greatly to the difficulty of cleaning it. Of the later varieties, Lot's wheat is the one most favourably regarded, and of which a considerable area is grown.

The use of fertilisers in the production of crops in this district is regarded as essential, and very few crops are now sown without the addition of manures. It is certain the successful cropping of the light soil is attributable solely to the use of commercial fertilisers, while their application to the stronger and richer soils is also money well spent, as the crops come on quicker and in dry seasons hold out better than on the unmanured land. The fertilisers most in use are Thomas's phosphate and superphosphate, the former predominating, while bonedust and guano are used in smaller quantities. The manures are drilled in at the rate of 60 to 80lbs. per acre, and, as far as can be seen, the results from the various fertilisers are about equal.

While the present season has been the most unfavourable known since settlement commenced in this district, the harvest prospects are by no means gloomy. The very dry weather experienced in August, during which only 30 points of rain fell, brought the crops to a complete standstill, and at that time many farmers regarded total failure as certain. The rains which fell during September, however, have put a totally different complexion on affairs, and while the hay crop will be considerably lighter than the average, in no case will there be any actual failures. The average yield of hay in this district may be put down at about one ton per acre, and from present appearances the hay crop this season should average from 12 to 15cwt., which cannot be regarded other than satisfactory when the light rainfall is taken into consideration. The farmers are inclined to view the light harvest with the greater equanimity from the prospect of good prices which are expected to rule for wheat and chaff. One feature of the crops in the district

With the exception of land which has been merely "scratched" in, the crops are mostly quite free from weeds. There are a few exceptions to this rule, however, and in some fields the plant known as wild mustard is showing up prominently. The presence of this weed in a crop not only robs the latter of moisture and nutriment, but from its hard, woody nature seriously reduces the value of the chaff, and growers will be wise to take all possible measures to rid and keep their fields free from it. In keeping land clean there is no better method than bare fallowing and sheep stocking. The sheep being run over the fallow whenever any signs of vegetation appears. Up to the present time the practice of keeping sheep has not been largely followed around Meckering, but there are so many advantages to be obtained from the addition of a small flock of sheep to the farm, that there is little doubt most farmers will adopt this system wherever their holdings are large enough.

The question of water supply is one which caused the settlers some anxiety last summer, and the short rainfall of the present year does not auger well for the coming season. On some properties well sinking has been gone in for during the past few months, and it is gratifying to be able to state that in most cases the results have been satisfactory, good supplies of water having been struck at depths varying from near the surface to a hundred feet. With water obtainable at such moderate depth, farmers will no doubt soon make all necessary provision for watering their stock.

Altogether, the agricultural development and prospects of the Meckering district are of a most satisfactory character, and the returns in the past have been sufficiently good to give settlers every confidence in the future. The settlers in this district have shown their ability to make hay while the sun shines, and well deserve the profitable results which have rewarded their efforts.

RAISING DUCKS FOR MARKET.

The Characteristics of the different Breeds.

The first thing the amateur needs is first-class breeding stock or eggs. There is sure to be a sad loss among your ducklings bred from debilitated stock. Good stock should be selected to start with, and, when properly fed and cared for, there need be no fear of loss. The Pekings are too well known to need a special description at this writing. They will lay from 120 to 149 eggs a year.

Aylesburys are good layers, often starting to lay in November and keeping it up through the winter and until the following August.

The Cayuga is extremely hardy, producing 80 to 90 eggs in the

eccentric duck, laying in spring and midsummer (when other ducks are moulting) and in the fall; averaging about 100 eggs.

The Rouen will average about 80 eggs per year.

The East India duck will lay three or four batches of about 12 eggs each in a season.

The gray call ducks are used for calling wild ducks down to places where the concealed hunters are eagerly pointing their guns to bag them. Each duck lays about 80 eggs.

The Indian runners are the Leghorns of duck alley, laying from 140 to 190 eggs each a year. The English breeders claim 225 eggs per duck each year.

The crested white averages from 95 to 110 eggs per annum.

Keep ducks on a good ration, let them get out in all sorts of weather, and eggs, good fertile eggs, will and must come. The use of green food to excess will make the carcass flabby. Celery seed is a great flavour-giver. The Atlantic farm and others have tried it, and find it a paying venture. The seed is purchased from the wholesale seed stores, and can be had for about 20 to 25 cents per pound. Celery stalks chopped fine are good also, as they give the desired mellow flavour peculiar to the wild ducks. Duck-raising is becoming more and more a business in itself, distinct from all other branches of poultry raising; and I believe the day is not far distant when the demands of the market will justify a more extensive branch along this line.—*Exchange.*

THE FEEDING OF SWINE.

How to make the most Pork for a Dollar.

Mr. D. Troutt, in *Swine Breeders' Journal,* says how to grow the most pork for one dollar will depend on several conditions. The question is really an important one. It has been discussed many times, and it may be a little difficult to find anything new in regard to it. Everyone seems to have an idea of his own, and my idea may be a little different from some others, but such as it is I give it. We can make pork by keeping a pig in a small pen and feeding it expensive food perhaps faster than some other ways; but we will will not get the most pork for the dollar. There is not much profit in it, and profit is what counts.

We cannot make much pork for a dollar from a scrub, to say nothing about profit. To make the most out of the money spent on the animal we must study the animal's ancestors as well as the animal himself. In other words, to make the most we must

have the right kind of blood to start with, and treat it right. It must come from vigorous stock, great feeders, fast growers, easy fatteners; those that answer quickly to feed of whatever kind. Therefore, first we must have the very best strains of blood to start with.

After having all this to start with, and our little fellow in the world ready to put to the test, it will be necessary to keep his mother in such shape as will cause her to produce the most and best food for him to start out on his pilgrimage through life toward the pork barrel. He must get a good start, and it must be kept up. There must be no backset, or we have lost more than we made. While he gets his support from his mother during the early part of his life, he will soon need a little outside help. This must be furnished in proper shape, such as a little wheat, corn, or oats in its original state, with milk added. He will soon begin to look for something else. This something else seems to be his natural food, and that is grass. He will now forsake his mother and become very independent.

From this on it is necessary to study economy more than before. For if we feed him one dollar's worth of food in order to produce one dollar's worth of pork, how much have we made outside of our work? Some cheap food in connection with grain is necessary at this time. Grass of some kind is the thing, as it costs very little in comparison to corn or wheat. We must give him a good help in addition in the shape of shorts, slop, corn, wheat, and oats with milk, if on hand; but to get the most pork for one dollar, some cheaper food is necessary in connection. A field of green wheat or rye or oats will furnish lots of cheap food early in the season, with green sorghum, Kaffir corn, or oats later; but the best of all, so far as our experience in Kansas goes, is a field of alfalfa.

I don't think much can be made on green food alone. It may grow some bone, but very little flesh. To grow flesh and bone at the same time the pig must have grain in some shape. Alfalfa will make the best grain of all green stuffs alone; and I make the claim that grain and green stuff combined will produce more pork than twice the amount of grain alone.

It is possible we could get a pig ready for market a little quicker on grain alone, but the cost would be greater. To get cheap pork, cheap food must be used; and unless we get a little profit for our money and time while we feed we had better invest our money in some other way and work at some other calling. A pig shut up in a small pen and stuffed with grain may grow plumper than one that is hustling in the field for some cheap food to help his gain; but it is easy to count without much figuring which dollar is the better invested—the one spent on the pig that is not helping himself, or the dollar spent on the one that adds another dollar itself.

To sum it up, we must get good breeding stock—good foragers, good feeders, fast growers, easy fatteners, and those that grow to

large size. Start them with care; make all the growth possible on green stuff and grain combined; get them to market as early as possible and get as good price as possible for them, and then we may count dollars profit instead of dollars lost. In this way we will surely prosper.

BEE NOTES.

By Jno. Sutton.

Before these notes appear, swarming will probably be over for the season, and the chief object of the apiarist should be to see his colonies are healthy and strong, especially is this required for the production of section honey. Some colonies have a great objection to sections, and will swarm out just as soon as they have the brood nest crowded without making any use of their super. Where such is the case, first give this colony an extracting super, and let them get fairly settled to work in these, then place your section super between the extracting super and the brood nest, leaving them thus for a few days, and so soon as they have begun to use the section super as they should do the extracting super can be removed, and used for the same purpose on another hive. Once started on the section supers no further trouble should be experienced, that is providing attention is paid to them, and another super given just before the one in use is completed, placing the second super under the full one. Don't leave full supers on too long, or the cappings may get covered with travel stains. The apiarist will notice that there are some colonies which may be safely left in charge of these supers until required, building them up four or five stories high, and the sections even then come out quite clean and nice, while others seem as though they took a delight in travelling over the finished comb with very dirty feet, and thus spoiling the look of otherwise good sound sections.

For extracted honey, if the best results are desired, see that both super and brood nest are crowded with bees. These are the colonies that leave a record at the end of the season, and that this may be accomplished good stock and young vigorous queens are essential, and if these points are properly carried out they will soon require a third storey to store in the honey, providing it is to be had.

Unless appliances are available for ripening extracted honey, it is best to leave the super on the hive until the frames are capped completely. By so doing, when the honey is extracted and properly strained, it is quite safe to put into tins or any vessel, and can be sealed without any fear of its going bad, as it surely would do were

it extracted in an unripe state and placed in a sealed package without giving it time to evaporate and ripen.

If you want to get the best results *never* extract from the brood nest or from a frame having brood and honey, and perhaps pollen.

While it is desirable to have colonies crowded with bees, it is just as necessary to see that there is plenty of room for storing the nectar. Pile up supers as high as may be desired until extracting time, but be just as careful to keep an eye on these, and an empty one placed directly on the brood nest just at the right time, otherwise, even with a young queen, there is danger of swarms issuing and seeking more room elsewhere.

ANNUAL SHOWS.

The following are the prize lists of the Annual Shows which have been held since the last issue of the *Journal*:—

GREENOUGH AGRICULTURAL SHOW.

1st October, 1902.

The following is the list of prize-winners:—

Horses.

Draught and blood stock:—Cart sire (champion prize): Jones Bros., 1. Cart mare (champion prize): D. Duncan. W.A. bred cart mare: D. Duncan, 1 and 2. W.A. bred cart sire: D. Duncan, 1; J. Reynolds, 2. Blood sire: G. R. Readhead, "Laden," 1; H. Pass, 2. Blood mare: Morrell, 1; F. Anderson, 2. Farm pair: R. S. Morrell, 1; D. Duncan, 2. Hacks, hunters, etc.—Gentleman's hack: H. Waldeck, 1; W. Hanlon, 2. Lady's hack: W. E. Oliver, 1; P. Hogan, 2. Fastest trotting horse: Miss Logue, 1. Sulky turnout: W. Hanlon, 1; T. Cream, 2. Pair buggy horses: W. Hanlon, 1; Saddlier, 2. Pony hack, 14·2 or under: Miss Logue, 1. Mounted infantry horse: H. A. Bone, 1.

Cattle.

Beef bull: R. Warrener, 1.; A. Clinch, 2. Dairy bull: H. Pass, 1; Beef cow (with calf at foot): D. Duncan, 1; R. Backshall, 2. Fat bullock, J. Eakins, 1; B. Connolly, 2. Dairy cow (to be milked on morning of show): J. C. Cant, 1; R. Backshall, 2. Shorthorn cow: Miss Denison, 1.

Sheep.

Crossbred ram: J. Bell, 1; R. A. Wilton, 2. Pen (three) crossbred ewes: Miss Denison, 1; R. A. Wilton, 2. Pen (three) fat wethers: R. Connolly, 1. Pen (three) fat lambs (under six months old): R. Connolly, 1; R. A. Wilton, 2. Merino ram (property of any person owning not more than 2,000 sheep): J. Eves, 1; D. Duncan, 2.

Pigs.

Boar: J. P. Rumble, 1; J. A. Thompson, 2. Sow: J. Reynolds, 2.

Poultry.

Turkeys: F. Mills, 1; A. Meadowcroft, 2. Ducks: J. Harrison, 1; Pearse and Herbert 2. White leghorns: W. H. James, 1; A. Meadowcroft, 2. Langshans: Pearse and Herbert, 1. Minorcas: F. Giles, 1; A. Meadowcroft, 2. Orpingtons: Pearse and Herbert, 1. Brown leghorns: W. H. James, 1; S. Haddy, 2. Andalusians: Pearse and Herbert, special. Malays: Pearse and Herbert, special. Capons: Pearse and Herbert, special. Bantams: Pearse and Herbert, special.

Vegetables.

Potatoes: J. Bell, 1; J. F. Wilton, 2. Three heads cabbage: T. Clinch, 2. Carrots: Mrs. Jones, 1; T. Clinch, 2. Onions: Miss Logue, 1; T. Criddle, 2. Turnips: J. A. Wilton, 1; Mrs. McCartney, 2. Swedes: T. Criddle, 1; Mrs. McDonald, 2. Beet: T. Criddle, sen., 1; Miss Doyle, 2. Parsnips: Mrs. McCartney, 1; J. McCartney, 2. Peck peas (in pod): T. Criddle, 1; A. Carker, 2. Peck French beans: Mrs. McCartney, 1; J. F. Morrell, 2. Peck skinless peas: Miss Doyle, 1; J. P. Rumble, 2. Peck broad beans: J. P. Rumble, 1; A. Carker, 2.

Flowers, Preserves, Produce.

Variety garden flowers: Miss Stokes, 1; Miss Carr, 2. Variety wild flowers: J. C. Stokes, 1; Miss Ridley, 2. Variety roses: Miss Maley, 1; Miss Carr, 2. Variety oranges: Miss Logue, 1. Pickles: Mrs. J. F. Morrell. Jam: Miss Logue, 1; Mrs. A. Clinch, 2. Fruit in syrup: Miss Logue, 1; Mrs. A. Clinch, 2. Loaf of bread made and baked by an amateur: Miss Duncan, 1: T. Harrison, 2. Quarter sack flour: A. Clinch, 1. Bushel wheat: J. P. Rumble, 1; T. Harrison, 2. Bushel barley: J. F. Morrell, 1; J. Reynolds, 2. Bushel oats: J. F. Morrell, 1; J. Reynolds, 2. Bag wheat in chaff: R. Connolly, 1. J. F. Wilton, 2. Side of bacon: Miss Doyle, 1; J. Reynolds, 2. Ham: Miss Doyle, 1; J. Reynolds, 2. Two lbs. butter: Mrs. J. F. Morrell, 1; Miss Logue, 2.

GERALDTON AGRICULTURAL SHOW.

3rd October, 1902.

The following is a list of the principal prize-winners:—

Horses.

Pair of farm horses: R. Morrell, 1; D. Duncan, 2. Filly (three-year-old or under): Mr. F. E. Mills, 1.

Blood Stock.

Stallion, any age (champion silver medal): T. R. Readhead's "Laden," 1. Stallion, any age (W.A. bred): T. R. Readhead's "Laden." Stallion, any age (champion silver medal): Messrs. Jones Bros.' Albyn's "Stanley," 1; Messrs. Drage Bros.', highly recommended. Stallion, any age (W.A. bred): Mr. D. Duncan, 1. Draught mare, any age (special): Mr. D. Duncan, 1 and 2. Brood mare, any age, visibly in foal or with foal at foot (special): Mr. R. H. Cowan, 1; Mr. T. J. Giles, 2. Filly or mare, three years or under (special): Mr. D. E. Grant, 1. Pony stallion, 14·2 or under (champion silver medal): Newmarracarra estate, 1; Mr. S. Haddy, highly recommended. Pony mare, 14·2 or under (special): Mr. Wm. McK. Grant, 1; Mr. W. J. Box, 2. Weight-carrying hack, up to 14st. (special): Mr. W. Hanlon, 1; Mr. H. Waldeck, 2. Hack, up to 11st. (special): Mr. H. Waldeck's "Ibex," 1; Newmarracarra estate's, "Brunnette," 2. Single-harness horse, Mr. W. Hanlon, 1. Springcart horse: Mr. W. H. Thomas, 1; Messrs. Cream and Co., 2. Pony hack, 14·2 and under: Mr. W. McK. Grant's "Irony," 1; Mr. K. L. Logue, 2. Lady's Hack: H. Waldeck, 1. Pair buggy horses: Mr. W.

Hanlon, 1; Mr. A. G. Sadlier, 2. Single sulky turnout: Mr. W. Hanlon, 1; Mr. D. Grant, 2. Tandem turnout: Mr. W. Hanlon, 1. Pony hunter: Mr. J. Wiley, 1.

CATTLE.

Shorthorn bull (champion prize): Mr. A. W. Edgar's "Duke of Derrimut II.," 1. Shorthorn bull, any age, W.A. bred (champion prize): Mr. A. W. Edgar's "Strathalbyn Monarch." Shorthorn bull, two years or under: Mr. A. W. Edgar's "Strathalbyn Monarch," 1. Shorthorn cow, any age: Newmarracarra's "Pride of Canowie," 1; Mr. A. W. Edgar's "Miss Matilda XVIII.," 2. Shorthorn cow, any age, W.A. bred: Mr. A. W. Edgar's "Strathalbyn's Gift," 1, Newmarracarra's "Marie May," 2. Shorthorn cow, two years and under: Mr. Edgar's "Strathalbyn's Gift," 1, Newmarracarra's "Oford II.," 2.

SHEEP.

Merino ram (champion prize): Sandsprings estate, "Shakespeare," 1. Merino ram, W. A. bred: Newmarracarra's "Great Scott," 1. Merino ewe: Newmarracarra estate, 1; Sandsprings estate, 2. Merino ewe, W.A. bred: Newmarracarra estate, 1; Sandsprings estate, 2. Three merino rams: Sandsprings estate, 1, Mr. W. Burges, 2. Three merino ewes: Messrs. Percy and Davis, 1; Mr. W. Burges, 2. Five merino ewes, W.A. bred: Newmarracarra, 1, Sandsprings, 2. Shropshire ram: Mr. F. Mills, 1. Lincoln ram: Mr. H. Hamersley, 1. Five fat lambs: Mr. W. H. Angel, 1. Best merino ram: Mr. R. E. Morrell, 1. Best three merino fleeces: Newmarracarra, 1.

SWINE.

Berkshire boar: Newmarracarra, 1. Tamworth boar: Messrs. Pearse and Herbert. White Yorkshire boar and sow: Mr. W. Angel, 1.

POULTRY.

Malay game cockerel: Messrs. Pearse and Herbert, 1. Malay game hen or pullet: Messrs. Pearse and Herbert, 1. Langshans, cock or cockerel: Messrs. Pearse and Herbert, 1. Spanish cock or cockerel: Mr. J. E. Giles, 1. Spanish hen or pullet: Mr. J. E. Giles, 1. Minorca cock: Mr. T. J. Giles, 1. Minorca cockerel: Mr. T. J. Giles, 1. Minorca hen: Mr. T. J. Giles, 1; Mr. S. Crabbe, 2. Minorca pullet: Mr. W. H. James, 1; Mr. S. Crabbe, 2. Wyandotte cock or cockerel: Newmarracarra, 1 and 2. Wyandotte hen or pullet: Newmarracarra, 1; Mr. J. H. Fletcher, 2. White leghorn cockerel: Mr. W. James. White leghorn hen: Mr. W. H. James, 1; Mr. H. Mainwaring, 2. White leghorn pullet: Mr. T. J. Giles, 1. Brown leghorn cock: Mr. H. Mainwaring, 1; Newmarracarra, 2. Brown leghorn cockerel: Mr. W. H. James, 1. Brown leghorn hen: Mr. W. H. James, 1; Mr. H. Mainwaring, 2. Brown leghorn pullet: Mr. W. James, 1; Mr. H. Mainwaring, 2. Andalusian cock: Mr. J. H. Fletcher, 1; Messrs. Pearse and Herbert, 2. Andalusian hen: Mr. J. H. Fletcher, 1; Mr. S. Crabbe, 2. Partridge cock: Mr. W. Jose, 1. Partridge hen: Mr. W. Jose, 1. Aylesbury drake: Mr. R. Burton, 1. Aylesbury duck: Mr. R. Burton, 1. Pekin drake: Messrs. J. and A. Ellis, 1. Pekin duck: Messrs. J. and A. Ellis, 1. Indian runner drake: Mr. W. H. James, 1. Indian runner duck: Mr. W. James, 1. Rouen drake: Mr. R. Burton, 1 and 2. Rouen duck: Messrs. J. and A. Ellis, 1. Best pair of geese: Messrs. J. and A. Ellis, 1. American bronzewing turkey cock: Mr. F. E. Miles, 1; Messrs. J. and A. Ellis, 2. American bronzewing turkey hen: Messrs. J. and A. Ellis, 1. Best pair of table cockerels: Messrs. Pearse and Herbert, 1; Mr. W. Jose, 2. Champion prize for best cock in the show: Messrs. Pearse and Herbert, 1. Champion prize for best hen in the show: Mr. W. H. James, 1.

LOCUST PLAGUE ON THE UPPER MURCHISON.

The following letter received by Mr. Despeissis from Mr. Gordon Shaw, of Errivilla Station, Upper Murchison, tells its tale of desolation inflicted by the locust plague:—

Errivilla Station, Upper Murchison, W.A.
6th September, 1902.

Are you "up" on a grasshopper (or locust?) plague? After the excellent January rains, swarms of these came from the East, and were observed to be weighted with what appeared to be a well filled egg receptacle. Then it seems innumerable hordes of little ones, of various colours, appeared on the ground vegetation, and shortly after the country swarmed with them flying. Now they are in mobs, congregated together here and there a mile or two square, through which one can scarcely drive a horse; he won't face them.

So far as I can see they are of varied colours, at various stages, and from what I hear of them from the Nor'-West they have, besides these we have, other sorts, especially a yellow-winged brute, said to be the worst. A gentleman up there, whose name I forget (Mr. Meare's partner), has been very successful, I understand, in destroying them by inoculation.

They simply *bare* the country they travel over of every leaf and blade. The river gums for miles are leafless. May they have come from the other colonies, driven out by droughts there? Can anything be done to destroy them? How long do they live?

Personally, I fear they have come to stay. If so, what use now our infrequent rains even? There is now a mob, two miles through, within half a mile of our garden, and I do not intend that they will bare it a second time, if I have to camp there and, with natives, keep them out by force. Crows, hawks, turkeys, etc., are all very fat through eating them.

I read somewhere of an expert on the subject. It was either in New South Wales or Victoria. Do you know of such a one to advise on the subject, and either give me his address, or quicker, send on this letter to him? They now cover a radius of hundreds of miles, and if they remain with us and breed, which they will do seemingly if we have summer rains again, are a very serious outlook for pastoralists, and will mean still dearer meat to consumers, for we can never fatten stock where they are. As well the rabbits at once. I read of an imported weed to destroy them, but we are too large a country for that remedy I fear, even if it would grow in this climate, and our condition. If you can assist, not only we, but all the district, will be benefited.—Yours faithfully, GORDON SHAW.

A few tubes of locust disease fungus, or mucor, cultivated by the Government Entomologist of Victoria from cultures received from South Africa, were despatched to Mr. Shaw, and a fresh supply has been applied for from Victoria. Conflicting reports are reported as the result of experiments in dealing with invasions of locust and grasshoppers by this method, but it is nevertheless worth trying. Under favorable conditions of climate and air-moisture it is said to act with much rapidity. Efforts have also been made to introduce from New South Wales a particular internal parasite

which is known to keep the locusts in check in Riverina and other districts. Owing to the prolonged drought, however, which has of late made vast areas bare of vegetation, Mr. Compére, when in the East lately, was unable to procure either these parasites or even their host, the locust. With the return of favourable seasons the introduction of these friendly insects will be taken in hand.

BACTERIA IN MILK.

Wonderful Rapidity with which they Multiply.

A press bulletin sent out by the Indiana Experiment Station calls attention to the fact that several dairies in that country sent milk to the Paris Exposition which remained sweet for a period of from 15 to 21 days after being drawn from the cow. No preservatives were used in this case, the keeping qualities of the milk being due to the fact that extreme care was taken at the time of milking to exclude all forms of dirt. In addition to this, the milk was kept at a low temperature, thus affording the most unfavourable conditions for the growth of organisms. Even where the greatest care is taken, a large number of organisms enter the milk at the time of milking, and the keeping quality of the milk only depends on the number that gain entrance at first and the manner in which the milk is afterwards kept. A covered pail used in milking reduced the number of germs that gained access to the milk one-quarter as compared with the common pail, while the milk containing the smaller number of organisms kept sweet for a period of 20 hours longer.

Milk allowed to stand two hours before being cooled was found to contain 23 times as many organisms as were present at time of milking. These organisms did not gain entrance into the milk from outside, but were simply the result of the multiplication of those that were present. Compared with this, it was found that milk of the same character which was cooled immediately to 54 degrees after being drawn only contained four times as many organisms at the end of two hours as were present at milking time. Such data as this emphasises the necessity of cooling milk as rapidly as possible after it is drawn.

The bulletin referred to calls attention to the fact that what is known as the "cowy taste" should be driven off by some means, and for this purpose it is recommended that the milk be freely aerated. Where no special apparatus is at hand for this purpose, a good practice is to pour milk from one vessel to another, or to stir the milk freely in the presence of a pure, sweet atmosphere. After milk has been thoroughly aerated and cooled there is no plan by which the growth of organisms may be checked so efficient as that of keeping it in ice water.

TO BREAK UP BROODY HENS.

A Method not usually Practised by Farmers.

Ask an old farmer the best way to break up a broody hen, and ten to one he will tell you : "Shut them up and starve them, or duck them in cold water; throw them as far as you possibly can every time you come near the nest; tie a rag on their tails or build a frame where they must always stand on the roost, with no chance of settling down." A short time ago I heard a new way, and as I have tried it and found it worked well, I will give it to your readers.

Remove your hen from the nest carefully—and here is a point which it is well to follow at all times: Always handle a hen as you would a child, with care and consideration, as they are tender things, and jerking affects their nervous systems just as much as it would affect your child to grab it by the arms and legs, and swing it over your head once in a while. That is something which many people, and even men and women who have made a study of the poultry business for many years, do not know, or else they do not care to know. But, to return to my subject. Take the hen carefully from the nest, place her in a comfortable place, but in altogether new surroundings, where there are no nests, and do not starve her by any means. On the contrary, feed her on all the rich concentrated foods she will eat, and especially see that she has some kind of animal food—green-cut bone is about the best for this. Be sure she has plenty of grit, some green food, and water. Do not forget the last, as what we wish to do is to get this hen in laying condition again, and in order to do this she must have plenty of good food and water. Before long we find our sitting hen has renewed her entire constitution; that old broody feeling passes away, and she feels like getting out and enjoying the air, and will soon be laying again.

The reason this process acts so well and so quickly is that a hen after laying a large number of eggs becomes worn out; her constitution has stood a heavy drain for all winter, perhaps, and she feels a desire, a very natural desire, to sit, because it is the nature of a hen to sit and raise a brood of chicks at least once a year. By raising this brood she rests herself, and that is usually why she is in good condition when winter comes.—*Exchange.*

ANSWERS TO CORRESPONDENTS.

Warts on Horse's Nose.—Mr. L. Treasure, Norlup, writes:—"I have a mare with warts on and in her nostrils, rendering it a difficult matter for her to breathe. Can you inform me if there is any cure for this, and if so, what?" The matter being referred to the Government Veterinary Surgeon, Mr. Weir reports:—"After applying a twitch and blindfolding the animal, take a pair of sharp scissors and remove each wart at its base, then apply a caustic, such as nitrate of silver, or a small searing iron, direct to each sore."

How to Dissolve Bones.—Mr. Jas. Smith, Guildford, writes:—"I noticed in the *Journal* some time ago a formula for dissolving bones by the action of sulphuric acid. In that formula no mention is made of the use of water. I read a paragraph elsewhere which stated that the bones should first be saturated with their own weight of water. Will you please inform me which is the correct process?" The matter being referred to the Field Officer, Mr. Wickham replies:—"The formula for dissolving bones is 50lbs. of sulphuric acid to 100lbs. of bones. Place the bones in a barrel or vat, and then add the acid, stir up well until the bones become a pasty mass, when dry the mass is broken up and ground. No water is used."

Sheltering Fruit Trees.—Mr. W. Gandir, Beaconsfield, writes:—"1, Will you inform me as to which fruit blossom it is necessary to protect from the wind. I am situated in a hollow or dip and get some of the winds very strong. 2, Will you also tell me what to do to prevent shoots of pear trees from being cut back by some cause. The trees make fair shoots of one foot to eighteen inches long, when the winds come and they are nipped right back to where they started to grow." The matter being referred to the H. and V. Expert, Mr. Despeissis reports as follows:—"1, Those trees want screening most which blossom during the period the equinoctial gales blow. Local experience would teach which they are, as trees of the same varieties blossom with variations of a week or two, according to locality, aspect, shelter, etc. 2, The pears may be attacked by pear 'mildew,' in which case sulphur would do good (see calendar under apples—powdery mildew), or from a bacterial disease, in which case cut the twigs to the quick when they begin to dip back, and burn the attacked parts. Strong winds will also do similar damage."

Green Bones for Fowls:—Mr. H. Roche, York, asks:—"Are fowls benefited by feeding on crushed green bone?" The matter being referred to the consulting poultry expert, Mr. Crawford reports:—"Green bone sliced or crushed mixed with the morning feed is one of the best foods that can be given to fowls, either for egg production or to chickens for making rapid growth. I have experimented with it for egg production in winter with the best results, and in England and America the experience of breeders is that there is nothing better. *Soft-shelled Eggs.*—The laying of these arises from two causes—the fowls being too fat, or a deficiency of lime in the food. As a general rule the first is the most likely, and in such case the fowls ought to get less fat-producing foods, such as wheat, maize, pollard, etc., and have oats, rye, or barley given them, or else feed less. In the other case bed-mortar or lime may be given."

Poultry-keeping.—A correspondent writes:—"Believing that there is money to be made out of poultry-farming, it is my intention to start one close to Perth. I would feel greatly obliged if you would answer the following queries, viz.:—The best method for preventing and for curing the tick pest. The most prevalent diseases of fowls, their detection, and cure. The best breed of fowl for laying and table purposes, and whether pullets are not better layers than older fowls. Any information as to caponising and its methods. Whether any assistance is given by the Government. I have not had experience in rearing fowls in large numbers, so that any hints you could give would be thankfully received. The place I have in view has about 80 acres of light soil, plenty of water, and about one acre of garden and orchard, with no one within a mile. Thanking you in anticipation." The matter being referred to the consulting poultry expert to the Department, Mr. Crawford reports:—"*Prevention of Tick.*—Houses illustrated in the June issue of the *Journal* the best way to prevent. *To Kill.*—Dip the fowls in kerosine emulsion, same strength as used for spraying. *Diseases.*—The best way is to get a book on poultry and their diseases, as they are liable to all kinds, and to reply fully to this would mean writing a book on the subject. *Breeds.*—The best laying breeds are Hamburgs, Minorcas, Leghorns, Anconas, Andalusians, and Spanish. The best table breeds are Dorkings, English Game, and Malays. *Pullets v. Hens.*—A fowl, as a rule, lays its greatest number of eggs between one and two years old. After the second year the number decrease rapidly, and nearly all large breeders sell off all their stock on reaching two years, or shortly after. Caponising is difficult to teach on paper, but easy when seen done. Messrs Sandover & Co. stock the instruments. It does not pay to go in for caponising in this country as people will not pay the extra price for them unless some private arrangement can be made with clubs or hotels to give a good price for the capons. The Government does not give any assistance that I am aware of. Without a considerable amount of experience poultry-breeding is a risky undertaking, as it is very easy to lose a lot of money at it. To be successful all the food should be grown on the place, as it rarely pays to have to purchase the feed. In keeping poultry healthy the principal things to attend to are plenty of good, hard, sharp grit, and for this an Enterprise mill should be used and all the crockery available put through it, and given to the fowls as much as they will eat. The other is good, pure water, and the water utensils kept as clean as possible. For gathering eggs in the winter there is nothing equal to sliced green bone. Machines for slicing it can be had. It is also invaluable as a feed for young chickens, given at the rate of about a teaspoonful per day to each six chickens when two or three weeks old, and this supply increased as they get older. In the Eastern States and California it is found that fruit-growing and poultry-breeding go remarkably well together, the poultry destroying a great number of the insect pests and helping to keep the trees clean. There is another most important point in poultry raising on a large scale, that is that not more than 20 fowls should be allowed to roost together at night. Where eggs only are wanted for domestic use, it is better to have no cocks with the hens; only have a male bird in the breeding pen. Cleanliness all through is the best preventative of disease, and the use of plenty of freshly-slaked lime. A light soil is the best for keeping poultry on."

MARKET REPORT.

For Month ending 30th September, 1902.

Messrs. G. & J. Withers & Co., produce merchants, corner of Wellington and Queen Streets, Perth, report having entered into their new and commodious warehouse, at above address, which has been specially built to meet their increasing business.

Chaff during the month has eased considerably, and prime lots are now fetching £6 15s. per ton in truck lots. New potatoes are in great demand, realizing from 15s. to 18s. per cwt. Produce realized as follows:—Chaff, prime: £6 15s. to £7 12s. 6d.; medium: £4 to £5 10s. Bran: £10 to £10 10s. Pollard: £10 to £10 10s. Wheat: 5s. 9d. to 6s. Flour, £11 15s. to £12 5s. Potatoes: £15 to £18. Onions: 10s. to 11s.

GARDEN NOTES FOR OCTOBER.

By Percy G. Wicken.

The weather is now becoming warm, and the moisture will be dying out of the ground and every effort must be made to conserve as much moisture as possible. Those who have established a system of irrigation are likely to reap the benefit of their enterprise; others who have no means of artificially watering their crops must devote their attention to retaining what moisture they have in the soil, by means of incessant cultivation. The horse or hand-hoe, as the case may be, must be kept constantly going and the surface soil well stirred; this causes it to act as a mulch and prevents the moisture in the sub-soil from evaporating. All weeds must be kept cut down as they only draw moisture from the soil, which is required by the growing crop. The soil should never be allowed to cake. A light harrowing will not do any harm after the seeds are up, but when the plants begin to get large the horse hoe must be used between the rows. In the vegetable garden a mulching of straw, stable manure, bush rakings, or any suitable substance placed around the plants and between the row is a great help in keeping the ground moist; at the end of the season it can be dug in, and acts as a manure for the following year. Work the ground as deeply as possible, and if transplanting any young plants, they require to be shaded by strips of bark or other material until they are established.

Beans (French or Kidney).—This vegetable does very well during the hot weather so long as there is sufficient moisture in the ground. Just before the plants come into flower it is advisable to apply a top dressing of a little sulphate of potash and superphosphate, mixed together in the proportion of 1 of sulphate to 2 of superphosphate. This manure should be dusted along the rows, and the plants then hilled up.

Beans (Lima).—This variety of bean may still be planted, and and should be extensively sown. There are both climbing and dwarf varieties, and they are very prolific. The climbing varieties can either be staked or allowing to run over the ground the same as cow peas.

Beans (Madagascar).—These beans should now be ready for staking; they are splendid climbers, and are ornamental as well as useful.

Beet (Red) —This vegetable is generally in favour during the summer months, as it is both palatable and cooling. There is a globe variety, which is perhaps easier to raise than the long variety.

Beet (Silver).—Those in the seed bed should be ready to plant out, and a little more seed may be sown for future use. They require plenty of manure. The outside leaves should always be taken off as required, and they continue to produce fresh leaves for a long period.

Cabbage.—Plant out any young plants that are ready, and sow a little seed for future use. Grubs are likely to become troublesome at this time of the year. The best remedy is to spray the plants with a mixture of Paris green and water, to which is added a little lime; 1lb. of Paris green to 200gal. of water, and about ¼lb. of lime, well stirred in. Keep the mixture well stirred while spraying.

Carrots.—A few rows may be sown to keep up a supply, and those already coming up must be kept free from weeds.

Celery.—Sow a little seed in a box or seed bed, and plant out any plants that may be ready. Celery requires to be well manured, and must be hilled up as soon as the plants attain any size, and care taken that no dirt gets between the stalks.

Cucumbers.—Those already sown should be well forward; a little more seed may be sown for future use. It is advisable to pinch off any straggling growths.

Maize (Sweet).—This is a very wholesome but much neglected vegetable. Seed may be sown any time during the month. The Sweet Maize are mostly dwarf varieties, and may be sown in drills about two feet apart, one foot apart in the drills.

Melons.—Those sown early in the season should now be well forward. A few more may be sown for later crops.

Pumpkins.—A few of the earlier varieties should be ready for cutting this month. The best variety to sow this month is the Rio or Bugle Pumpkin; they are very good for pies and preserves.

Sweet Potatoes.—Cuttings from those planted in the seed bed should now be ready for planting out; they should be put out on ridges three feet apart. Full particulars as to the cultivation of this crop will be found in August issue of the *Journal*, p. 76, Vol. IV., 1901.

Tomatoes.—Those sown early should now be doing well, and in some parts they will require staking. Tomatoes are already coming into the market from the warmer parts of the State. Plant

out all available plants as soon as possible; they require to be heavily manured. Well-rotted stable manure is the best if it can be obtained, otherwise an artificial manure, rich in nitrogen and potash, must be applied.

Farm.—This is one of the busiest months of the year on the farm. In the earlier districts hay-making is in full swing; but the area will, I am afraid, be smaller than usual, owing to the dry winter; and the straw will also be short, especially so in the Eastern districts. Those who intend leaving their crops for grain should take every reasonable precaution against fire. It is often advisable to cut the outside strip round the paddocks for hay, and to run the plough or scarifiers round the strip thus cleared. This strip will then act as a firebreak. Those who have not already done so should look to their reapers and binders, and see that all harvesting machinery is in good order for an immediate start. Where the land is not too dry, such crops as cow pea, soy bean, Lima beans, millets, and sorghums may be sown, and in the South-West maize for green feed.

CLIMATE OF WESTERN AUSTRALIA FOR SEPTEMBER, 1902.

Throughout the State South of the Tropics this month was decidedly wet, in compensation for the extremely dry weather experienced during August and the general rains which set in on the 7th, proved most beneficial to the agricultural districts, where the fall for the month was from 1 to 2 inches above the average.

Very heavy weather was felt on the South-West and South coast between the 9th and 13th.

The rainfall at the Perth Botanical Gardens, 555 points, has only been exceeded on one occasion, viz., 601 in 1890.

The Climate Maps show that the atmospheric pressure throughout the State was about normal, except in the South-West, where it was below, and the temperature about an average.

Two stations in the Tropics, viz., Marble Bar and Derby, registered 100° in the shade.

Cold nights were still experienced inland as is shown by the following table:—

Terrestrial Minimum Temperature.

Station.	Mean.	Lowest.	Date.
Cue	46·6	35·0	13
Coolgardie	42·8	33·0	15
Southern Cross	40·9	30·2	13
Walebing	39·9	31·0	14
York	38·6	31·4	10
Perth Observatory	44·7	36·0	12
Bridgetown	35·7	31·0	11, 16, 21
Karridale	44·3	29·2	27
Katanning	37·5	25·8	10

The Climate of Western Australia during September, 1902.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					September, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	29·996	29·936	30·189	29·784	92·1	73·1	82·6	95·9	67·5	96·7	74·2	111·0	64·0	Nil	2167
Derby	29·996	29·970	30·170	29·868	94·4	64·3	79·4	100·2	57·2	93·7	65·9	106·0	54·0	Nil	1507
Broome ...	30·028	29·983	30·175	29·870	88·2	64·6	76·4	97·0	57·0	88·6	63·3	101·0	49·0	Nil	2222
Condon ...	30·018	30·012	30·170	29·869	87·5	56·0	71·8	97·5	47·0	85·5	56·5	98·8	42·0	Nil	2074
Cossack ...	30·028	30·016	30·193	29·874	88·4	60·5	74·4	98·4	52·5	84·4	63·3	101·0	52·0	Nil	1297
Onslow ...	30·061	30·054	30·208	29·880	84·2	56·8	70·5	95·0	51·2	83·6	54·5	103·0	43·5	47	441
Carnarvon ...	30·082	30·068	30·263	29·870	74·5	57·6	66·0	83·0	51·0	78·8	55·4	97·0	43·0	91	898
Hamelin Pool...	30·112	30·088	30·309	29·812	74·9	53·6	64·2	84·8	45·2	78·4	51·7	96·8	40·0	190	689
Geraldton ...	30·101	30·110	30·378	29·760	71·6	52·6	62·1	88·0	43·0	70·4	51·6	94·0	39·0	156	1385
INLAND:															
Hall's Creek ...	30·030	...	30·269	29·870	92·9	58·4	75·6	97·3	42·8	94·4	61·8	99·8	42·2	2	1389
Marble Bar ...	...	...	...	...	93·9	59·8	76·8	100·0	49·2	...	...	...	...	Nil	1202
Nullagine ...	30·020	30·014	30·201	29·764	88·8	52·1	70·4	96·0	39·0	87·8	55·4	98·5	39·8	Nil	1336
Peak Hill ...	30·080	30·057	30·283	29·666	78·3	54·3	66·3	89·2	43·8	78·6	52·7	91·0	38·1	22	1872
Wiluna ...	30·036	...	30·320	29·760	78·1	49·5	63·8	89·8	39·5	...	...	...	...	18	1318
Cue	30·082	30·088	30·317	29·710	76·4	50·9	63·6	87·8	43·1	77·3	49·7	93·2	37·0	35	879
Yalgoo ...	30·070	30·098	30·381	29·669	74·0	49·1	61·6	86·0	42·0	75·9	47·1	93·6	35·9	65	606
Lawlers ...	30·054	30·150	30·310	29·732	75·5	49·5	62·5	87·2	36·4	75·4	48·4	95·2	34·7	142	1133
Laverton ...	30·058	...	30·369	29·725	75·2	49·3	62·2	93·1	37·7	...	...	...	...	142	1120
Menzies ...	30·052	30·090	30·323	29·627	73·3	49·9	61·6	85·5	35·8	73·0	47·7	92·1	33·5	56	1080
Kalgoorlie ...	30·068	30·103	30·330	29·590	71·8	49·7	60·8	83·9	37·0	71·8	48·0	90·8	34·9	119	923
Coolgardie ...	30·052	30·113	30·308	29·616	71·5	48·3	59·9	83·6	38·0	71·6	46·5	92·0	35·0	192	1047
Southern Cross	30·052	30·090	30·327	29·662	72·1	44·7	58·4	82·1	35·2	71·3	43·3	95·0	31·0	93	905
Walebing ...	...	...	...	...	67·7	43·2	55·4	80·0	35·0	...	...	...	...	233	1090
Northam ...	...	...	...	...	69·1	44·4	56·8	81·0	35·4	...	...	...	...	196	896
York	30·068	30·099	30·395	29·641	69·0	33·0	56·0	78·8	34·5	67·1	44·3	95·0	30·0	207	987
Guildford ...	...	...	...	...	69·2	46·3	57·8	82·8	38·8	...	...	...	...	517	2176

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during September, 1902—*continued.*

Locality.	Barometer (corrected and reduced to sea level). Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. September, 1902. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	*Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens	30·088	30·098	30·420	29·620	67·5	49·8	58·6	78·4	42·6	68·7	49·4	89·0	35·0	555	2470
Perth Observatory	30·090	30·129	30·416	29·614	65·8	49·7	57·8	78·0	42·7	66·5	50·5	86·4	39·0	519	2551
Fremantle ...	30·100	30·082	30·400	29·622	64·0	53·1	58·6	73·0	45·2	65·3	51·3	84·0	39·0	512	2341
Rottnest ...	30·066	30·130	30·383	29·982	64·2	54·1	59·2	70·2	40·2	65·6	51·1	83·0	40·0	363	2129
Mandurah ...	...	...	...	...	65·6	54·4	60·0	70·3	39·5	...	...	...	...	529	2466
Wandering ...	...	...	...	...	64·8	40·1	52·4	74·0	30·0	...	...	...	...	363	1586
Collie	...	...	...	...	64·0	41·7	52·8	74·0	31·9	...	...	...	...	536	2499
Donnybrook ...	...	...	...	...	65·6	44·8	55·2	73·9	33·8	...	...	...	...	449	2635
Bunbury ...	30·065	30·084	30·409	29·590	65·1	51·5	58·3	74·0	37·0	63·9	47·8	83·8	32·2	440	2312
Busselton ...	...	...	...	...	65·0	48·2	56·6	79·0	37·5	...	...	...	...	249	2240
Bridgetown ...	...	...	...	...	64·6	41·3	53·0	73·0	33·1	...	...	...	...	450	2648
Karridale ...	30·039	30·107	30·365	29·523	63·1	49·8	56·4	73·2	36·2	63·6	48·4	82·5	31·5	640	4035
Cape Leeuwin	30·005	30·056	30·392	29·265	62·2	53·9	58·0	68·2	46·4	62·9	53·8	79·5	43·8	481	2864
Katanning ...	30·054	39·098	30·351	29·652	64·8	44·9	54·8	72·8	33·0	65·2	42·5	88·0	29·8	268	1244
Albany ...	30·032	30·059	30·357	29·380	63·8	47·9	55·8	72·4	37·8	61·5	48·2	84·8	34·0	538	3639
Breaksea ...	30·012	30·075	30·329	29·374	61·1	51·8	56·4	70·5	42·0	61·5	50·7	84·2	40·0	324	2039
Esperance ...	30·022	30·057	30·361	29·535	67·0	48·1	57·6	84·5	40·6	66·7	48·2	96·0	34·0	265	1710
Balladonia ...	30·038	...	30·385	29·441	70·8	44·9	57·8	86·8	37·5	...	...	...	...	115	830
Eyre	30·028	30·107	30·440	29·638	70·0	46·3	58·2	89·0	33·5	67·0	47·1	90·2	34·0	229	1244

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
8th October, 1902.

W. E. COOKE,
Government Astronomer.

RAINFALL for August, 1902 (completed as far as possible), and for September, 1902 (principally from Telegraphic Reports).

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
EAST KIMBERLEY:				
Wyndham ...	Nil	...	Nil	...
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	2	1
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	Nil	...	2	1
Flora Valley ...	...	...	...	...
Ruby Creek ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	Nil	...	...	...
WEST KIMBERLEY:				
Beagle Bay ...	Nil	...	...	...
Obagama ...	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	Nil	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	Nil	...	Nil	...
NORTH-WEST:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
De Grey River ...	7	1	...	...
Port Hedland ...	30	2	3	1
Boodarie ...	17	1	...	...
Yule River ...	...	...	...	...
Warralong ...	28	2	...	...
Muccan	...	...	...	...
Ettrick	7	1	...	...
Mulgie	...	...	...	...
Eel Creek ...	6	1	...	...
Pilbarra	25	...	Nil	...
NORTH-WEST—*cont.*				
Coongon	...	...	...	...
Warrawagine ...	Nil	...	...	...
Braeside... ...	...	...	...	...
Bamboo Creek ...	23	1	Nil	...
Marble Bar ...	37	1	Nil	...
Warrawoona ...	27	1	Nil	...
Corunna Downs...	32	1	...	...
Nullagine ...	70	...	Nil	...
Yandicoogina ...	...	...	...	...
Kerdiadary ...	...	...	...	...
Roy Hill... ...	45	1	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	...	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	...	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	7	1	Nil	...
Cooyapooya ...	...	...	...	...
Woodbrooke ...	...	...	...	...
Croydon	Nil	...	...	...
Balla Balla ...	9	2	6	1
Roebourne ...	2	1	1	1
Cossack	Nil	...	...	...
Fortescue ...	15	1	Nil	...
Mardie	25	2	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	15	2	...	...
Onslow	12	1	47	1
Peedamullah ...	...	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	23	2	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	...	...	...	...
Point Cloates ...	57	91	...	...
GASCOYNE:				
Winning Pool ...	13	1	8	...
Towara	...	...	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	...	...	...	...
Thomas Police St'n	...	...	...	...

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
Gascoyne—*contd.*				
Bangemall	72	2	...	...
Mt. Augustus	...	...	...	...
Minnie Creek	38	3	...	...
Gifford Creek	49	1	...	...
Yanyeareddy	5	1	...	...
Williambury	8	1	...	...
Wandagee	...	...	...	...
Bernier Island	58	4	...	...
Boolathana	...	...	...	...
Carnarvon	38	2	91	4
Cooralya	...	...	...	...
Doorawarrah	...	...	...	...
Mungarra	27	2	...	...
Clifton Downs	20	2	...	...
Dairy Creek	..	...	...	...
Mt. Clere	90	3	...	...
Errivilla	...	...	...	...
Dirk Hartog Island	81	2	...	...
Sharks Bay	75	2	96	5
Kararang	83	1	...	...
Meedo	...	...	...	...
Tamala	...	...	...	...
Wooramel	60	3	153	6
Hamelin Pool	58	4	190	6
Byro	17	2	...	...
Yarra Yarra	...	...	...	...
Berringarra	30	1	...	...
Mt. Gould	...	...	...	...
Moorarie	124	4	...	...
Wandary	108	4	...	...
Peak Hill	74	5	22	2
Horseshoe	85	5	17	2
Abbotts	135	3	16	1
Belele	...	...	...	...
Mileura	43	2	...	...
Milly Milly	...	...	...	...
Manfred	19	2	...	...
New Forrest	144	5	...	...
Woogorong	62	2	...	...
Boolardy	...	...	...	...
Billabalong	34	3	...	...
Wooleane	10	1	...	...
Murgoo	24	3	...	...
Meeka	Nil	...	...	...
Mt. Wittenoom	4	1	32	2
Nannine	77	4	22	3
Star of the East	81	4	23	3
Annean	78	4	...	...

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
Gascoyne—*contd.*				
Tuckanarra	68	5	32	4
Coodardy	31	1	15	3
Cue	43	3	35	3
Day Dawn	34	1	10	2
Lake Austin	45	2	40	4
Lennonville	16	1	37	3
Mt. Magnet	17	1	56	2
Wurracoothara	...	...	...	...
Challa	83	3	...	...
Youeragabbie	25	1	41	2
Murrum	17	1	...	...
Burnerbinmah	27	2	...	...
Yalgoo	51	...	65	4
Gabyon	68	3	...	...
Wurarga	59	3	...	...
Barnong	82	5	...	...
Gullewa	...	...	111	4
South-West Division (Northern Part):				
Murchison House	64	4	...	...
Mt. View	45	4	...	...
Mumby	120	14	278	14
Yuin	48	3	...	...
Northampton	129	4	470	10
Mt. Erin	57	6	...	...
Oakabella	123	4	357	11
Narra Tarra	65	2	...	...
Mullewa	74	5	242	11
Kockatea	19	2	...	...
Bootenal	...	...	...	...
Geraldton	74	4	156	14
Greenough	77	4	298	11
Dongara	127	2	129	8
Dongara (Fearse)	128	5	141	10
Strawberry	46	4	...	...
The Camp	...	...	...	...
Mingenew	32	5	258	12
Rothesay	...	...	...	...
Field's Find	40	2	...	...
Carnamah	52	5	200	10
Watheroo	26	2	197	9
Dandaragan	34	3	376	10
Moora	51	2	200	11
Yatheroo	35	3	331	12
Walebing	89	4	233	14
New Norcia	65	3	245	13

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	97	4	507	13
Belvoir	74	3	474	14
Mundaring ...	74	4	665	15
Guildford ...	41	4	517	15
Kalbyamba ...	48	5	529	17
Canning W't'r'w'ks	50	3	...	...
Perth Gardens ...	48	3	555	17
Perth Observatory	46	4	519	17
Subiaco	47	4	456	16
Claremont ...	54	3	527	15
Fremantle ...	63	6	512	15
Rottnest	85	5	363	18
Armadale ...	69	4	429	13
Rockingham ...	110	5	438	13
Canning River ...	35	5	...	...
Jarrahdale ...	53	2	642	14
Mandurah ...	92	5	529	13
Pinjarra	47	5	537	14
Yarloop	51	5	560	16
Harvey	106	8	575	16
South-West, Central Part (Inland):				
Hatherley ...	48	4	...	...
Momberkine ...	67	3	200	9
Mouglin ...	56	3	...	...
Culham	63	3	259	12
Newcastle ...	52	4	213	14
Eumalga ...	65	4	240	13
Northam ...	47	3	185	11
Grass Valley ...	63	2	198	14
Meckering ...	30	3	145	9
Cunderdin ...	75	4	155	10
Doongin	24	4	167	10
Cuttening ...	21	3	213	11
Whitehaven ...	31	3	226	9
Sunset Hills ...	118	6	260	12
Cobham	57	3	230	14
York	62	6	207	14
Beverley ...	88	5	282	12
Barrington ...	...	...	...	...
Sunning Hill ...	128	6	...	...
Wandering ...	111	11	363	18
Pingelly ...	54	4	243	11
Marradong ...	100	7	539	15
Bannister ...	159	6	454	18

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
South-West—*contd.*				
Narrogin ...	141	7	391	8
Wickepin ...	144	5	245	12
Gillimaning ...	96	6	310	13
Bunking ...	...	...	...	...
Bullock Hills ...	271	6	322	13
South-West Division (Southern Part):				
Bunbury ...	82	8	440	18
Collie	166	8	536	19
Salvation Army Settlement	102	5	592	17
Glen Mervyn ...	153	7	636	17
Dardanup ...	113	6	...	...
Donnybrook ...	99	7	449	18
Boyanup ...	137	6	345	16
Ferndale ...	98	3	544	17
Busselton ...	75	9	249	18
Margaret River	261	6	...	...
Lower Blackwood	110	5	739	18
Karridale ...	415	14	640	17
Augusta ...	468	12	...	...
Cape Leeuwin ...	269	9	481	21
Biddellia ...	279	9	...	...
Lake Muir ...	390	13	405	19
Mordalup ...	312	10	336	18
Deeside	400	12	394	15
Riverside ...	388	10	423	16
Balbarup ...	340	11	455	20
Wilgarup ...	320	11	476	19
Mandalup ...	183	5	533	19
Bridgetown ...	187	11	450	21
Greenbushes ...	105	3	445	19
Greenfield ...	197	7	470	14
Glenorchy ...	173	7	254	12
Williams ...	128	7	399	15
Arthur	129	7	322	14
Darkan	183	6	363	...
Wagin	197	8	309	12
Glencoe ...	214	7	410	14
Dyliabing ...	216	8	325	12
Katanning ...	203	8	268	13
Kojonup ...	229	7	442	15
Broomehill ...	216	10	323	14
Sunnyside ...	183	8	310	15
Woodyarrup ...	180	9	298	16
Cranbrook ...	228	5	...	...
Blackwattle ...	287	8	...	...

RAINFALL—*continued.*

Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.	Stations.	August. No. of points. 100 = 1in.	August. No. of wet days.	September. No. of points. 100 = 1in.	September. No. of wet days.
South-West—*contd.*					Eastern—*contd.*				
Mt. Barker ...	595	8	506	19	Burbanks P.O. ...	150	7	243	6
Kendenup ...	417	12	552	19	Burbanks Birthday Gift	155	5	238	6
St. Werburgh's...	539	8	...	...	Woolubar ...	145	4	...	...
Forest Hill ...	504	12	456	20	Widgiemooltha...	118	6	187	8
Denmark ...	636	8	628	16	50-Mile Tank ...	82	4	310	8
Grasmere ...	73	13	611	10	Norseman ...	119	7	213	10
Albany	720	10	538	19	Bulla Bulling ...	177	6	274	6
Point King ...	536	11	580	19	Woolgangie ...	200	4	298	7
Breaksea ...	432	12	324	17	Boorabbin ...	254	7	176	7
Cape Riche ...	691	10	...	...	Karalee	170	5	166	8
Pallinup ...	164	7	274	15	Yellowdine ...	86	5	93	5
Bremer Bay ...	439	9	298	17	Southern Cross...	83	6	93	8
Jarramongup ...	153	8	...	...	Mt. Jackson ...	130	5	58	3
					Bodallin ...	33	2	104	4
Eastern Division:					Burracoppin ...	142	4	103	4
Lake Way ...	96	5	18	3	Kellerberrin ...	21	4	161	9
Mt. Sir Samuel ...	89	5	43	3	Mangowine ...	...	...	...	...
Lawlers	89	5	142	4	Wattoning ...	...	...	...	...
Leinster G.M. ...	101	4	...	...					
Lake Darlôt ...	62	5	...	...					
Diorite King ...	...	...	...	...	Eucla Division:				
Mt. Leonora ...	64	6	107	6	Ravensthorpe ...	86	9	296	14
Mt. Malcolm ...	...	...	62	4	Coconarup ...	34	6	...	...
Mt. Morgans ...	75	6	75	4	Hopetoun ...	93	8	468	16
Burtville ...	80	7	58	4	Fanny's Cove ...	100	7	...	...
Laverton ...	79	6	142	4	Park Farm ...	74	9	...	...
Murrin Murrin...	74	6	56	5	Esperance ...	75	11	265	16
The Granites ..	68	3	78	3	Gibson's Soak ...	100	7	246	12
Tampa	101	5	67	4	30-Mile Condenser	92	...	...	...
Kookynie ...	122	8	61	4	Swan Lagoon ...	104	10	...	...
Niagara	120	...	85	5	Grass Patch ...	108	9	...	...
Yerilla	134	5	63	3	Myrup	116	9	...	...
Edjudina ...	47	6	...	...	Lynburn ...	149	9	...	...
Menzies	142	4	56	5	Boyatup... ...	161	8	...	...
Mulline	...	...	184	4	Middle Island ...	173	9	...	...
Wangine ...	...	...	...	...	Point Malcolm ...	...	...	...	...
Waverley ...	120	6	172	6	Israelite Bay ...	99	8	124	7
Goongarrie ...	113	4	90	5	Bulbinia ...	168	9	...	...
Mulwarrie ...	132	7	234	7	Frazer Range ...	95	5	...	...
Kurawa	177	6	106	5	Balladonia ...	105	8	115	7
Kurnalpi ...	74	5	92	6	Southern Hills ...	119	6	...	...
Bulong	105	6	93	7	Eyre	109	9	229	9
Kanowna ...	253	5	96	6	Clifton Downs ...	67	4	...	...
Kalgoorlie ...	159	7	119	6	Mundrabillia ...	...	...	...	...
Coolgardie ...	171	5	192	6	Eucla	47	5	128	8

The Observatory, Perth,
8th October, 1902.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during September, 1902.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	10160	8779	1381	1381	5732	...	2088	...	...	428	...	278	150	...	...	...	103	...	...
Albany	152	127	25	25	63	...	9	...	...	11	...	44	...	...	...	...	...	...	...
Geraldton ...	25	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	10337	8931	1406	1406	5795	...	2097	...	...	439	...	322	150	...	...	...	128	...	...

Department of Agriculture,
3rd October, 1902.

Return of Fruit Trees and Plants imported into Western Australia during September, 1902.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Package dipped.	No. of Trees.															
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	8	685	8	685	...	...	...	470	...	15	...	...	...	...	...	...	85	15	...	...	100	...	...
Albany ...	1	50	1	50	...	...	...	44	...	...	...	...	...	6	...	...	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	9	735	9	735	...	...	...	514	...	15	...	...	...	6	...	...	85	15	...	...	100	...	...

Department of Agriculture,
3rd October, 1902.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

Feeding for Milk.—If rich milk is wanted, feed cakes and meals to the cows, along with chaffed hay and straw; if quantity rather than quality is the object, give them plenty of brewers' grains, malt culms, and roots. A mixture of maize, rice, and bran or pea-meal with a moderate quantity of grains and some bran and cake, all blended nicely with chaffed straw and hay, and supplemented by a few roots, particularly mangolds, will give a large yield of good milk if the cows are of the right sort and properly cared for.

Poultry.—Don't waste good grain and good time and good attention on scrub hens. You can't afford to keep them. If your hens are not averaging you 14 or 15 dozen eggs a-piece during the year you are not making as much money as you ought. It takes about eight dozen of eggs a year to pay a hen's board and keep, and, says the *Maine Farmer*, if you let her fall under that you are keeping her at a loss. Don't do it. Get rid of the mongrel stock you have and start in with thoroughbreds. The scrub hen is causing a loss to the farmers of millions of dollars every year.

Lucerne.—We often hear it said that lucerne will not grow in this State; the reason is mostly due to the deficient cultivation given to the soil before the seed is sown. At the Northam Agricultural Show, held last month, several good samples of lucerne were shown, one in particular, grown by Mr. L. A. Solomon, was 3ft. 6in. in height; and Mr. Solomon assured us that no artificial watering had been given to the crop since it was sown in September, 1901. The reason to which he ascribed the growth was to the cultivation he had given to the crop during the dry season.

Annual Shows.—The Hon. the Minister for Lands in speaking at Katanning, in referring to the annual shows, said:—"The Government desired to assist the agricultural industry by just and legitimate means. He would like to offer a suggestion as to the working of the shows. It was their general desire to have Ministers and members of Parliament present on these occasions, and it was desirable that they should be present at every show. It was a very difficult matter to attend them all, and he would suggest a unification of forces and the holding of one show only at a different centre each year. This would then give the Ministers and members an opportunity of attending in full force."

Lambs with Tapeworms.—Tapeworms gain access to the systems of lambs and other animals by being taken into either the food or water while in a very early stage of development, and when once they enter the stomach and bowels of the sheep they quickly

undergo a remarkable change, resulting in a tapeworm. The following treatment will be found effectual:—Keep the lambs without food for eight or 10 hours, and then drench each one with the following: turpentine, 1 drachm; liquid extract of male ferns, 20 minims; powdered areca nut, 1oz.; water, 1oz. Keep them without food for two hours after. Repeat this dose in a week, and then give them 1 drachm of sulphate of iron to each four lambs once each day in some dry food, such as crushed oats, cake dust, etc.

A NOVEL INCUBATOR:—Carrying the larvæ of peach moths around next the skin of his body, in order to prematurely hatch the insect, is the sacrifice to science which Entomologist Warren T. Clark, of the University of California, made in order to conduct an experiment. The result was a success, and the loss of fruit from this pest will, it is estimated, be reduced from 60 per cent. to 1½ per cent. Professor Clark went to Newcastle to study the means of checking the ravages of the peach moth. He noticed that the winter spraying the orchardists did had no influence on the pest, since the worms were buried beneath the bark. Then, in order to determine whether the warmth of spring would bring out the larvæ, he transformed himself into an incubator, with the result that the worms did appear. Since the experiment demonstrated that spring spraying was the most effective, that period of the year will henceforth be the spraying period, and the loss to the peach crop, which has hitherto been enormous, will be greatly diminished.

REARING CHICKENS.—In raising chicks the sexes should invariably be separated as soon as their sex can be distinguished. The young cockerels need more food than the pullets, and get it. They are absolutely destitute of chivalry: that comes later in life. They trample the pullets out of the way and take the choice morsels. Of course, if a surplus of food is supplied, the pullets will get all they need at the second table, but that is not a good thing to do. It is as bad for chicks as for children to have them leave food on the plates. Everything should be eaten up clean. In time, of course, cockerels are separated from yarded pullets, but, as a rule, the separation is too long deferred. The mission of the cockerel is to get his head to the block at the earliest day possible, and be fat when he gets there. This is best accomplished by an early separation from the pullets. If anyone doubts that young cockerels eat more than pullets, let him select separate pens of the same number and age and weigh the food for a week. The pressure of competition is beginning to do its work among farmers. The smartest are beginning to see that profit is attained only by the strictest attention to little things. Our poultrymen do not seem to be as bright as the housewives of Kansas and Missouri. Their poultry makes the transcontinental journey and arrives here fat. Ours comes from nearby farms and arrives here scrawny. Hence the better price for Eastern poultry. To make good poultry at a

profit the chicks must have all they will eat clean from the day they are hatched. Separating the sexes will give both a better chance.—*Exchange.*

The Art of Milking.—The care of milk does not commence when it is first taken from the cow, but with the cows themselves. In order to have pure milk it is necessary to have the cows perfectly contented and in good health. They should not be allowed to be worried by dogs or children, as it will affect the condition of their milk. They should have abundance of good food and free access to salt, and plenty of good water within their reach at all times. Care must be taken to see that they get no food or impure water that would taint their milk in any way. Turnips or rape should never be fed to milch cows. Milking should be done at the same hour morning and evening, and by the same persons, if possible. The milking should be done in a good clean yard or stable, where there are no foul odours that would taint the milk. Noise of any kind should not be allowed in the milk yard or stable that would have a tendency to excite the cows. Before the pail is put under the cow all dirt and dust that might fall in the pail should be brushed off her udder and body. If it cannot be brushed clean, her udder should be washed with warm water and then wiped dry. Only tin pails should be used for milk. The milking should be done with dry hands. Milk should always be strained as soon as the milking is done, and then well aired, either by means of a good aerator or by dipping or pouring in such a manner as to expose it freely to the air. Care must be taken to do this in a pure atmosphere. If not, it will do the milk more harm than good. Milk is not prevented from turning sour by aeration unless the atmosphere is cool enough to lower the temperature of the milk. It is, therefore, very necessary in hot weather to cool the milk to about 65 or 70 degrees Fahrenheit. This may be done by means of a tin cooler filled with ice cold water, being placed in the can of milk. When the water becomes warm it should be changed again, as it is more of an injury than benefit to the milk when it becomes the same temperature. Milk will keep better in small quantities than in one large can. Milk should be protected from sun and rain. The morning's milk should never be mixed with the night's milk. The care of cans, pails, etc., is also very important. I believe there is a great amount of milk soured and tainted by the utensils not being properly washed. All utensils used for milk should be first washed with warm water, then thoroughly washed with hot water, then scalded with boiling water and left to air until again needed for the milk. I prefer a brush instead of a cloth for washing with, as it gets into the seams better and is less liable to retain bad germs which might taint the milk.—*Exchange.*

THE WANNEROO DISTRICT.

The following report by Mr. A. Despeissis, the Viticultural and Horticultural Expert of the Department, was sent to the Hon. the Minister for Lands for his information :—

"I beg to report on a short visit I made on the 15th and 16th to a portion of the Wanneroo District. On a previous occasion, towards the end of May, I had an opportunity of visiting another portion of the district. These visits were made at the instigation of the Wanneroo Farmers and Gardeners' Association.

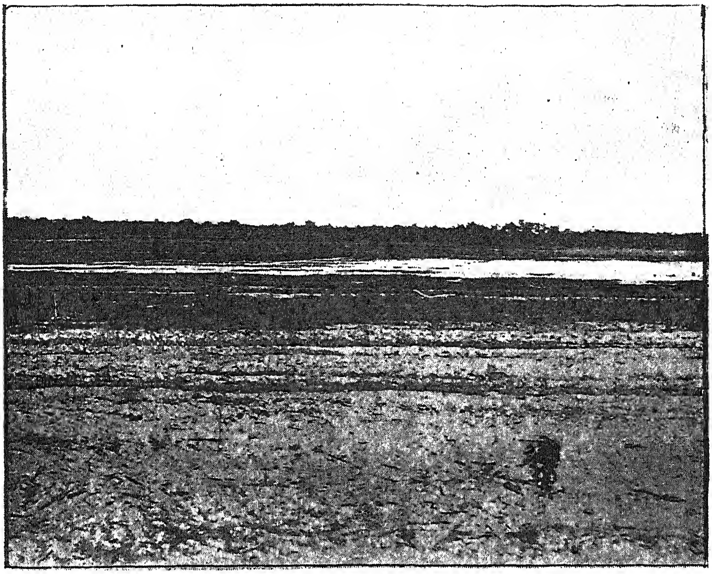
"The capabilities of the district have only of late attracted some degree of attention. Although it adjoins the metropolitan area, the bar to its settlement has hitherto been the absence of made roads; the hauling of produce, owing to the undulating nature of the country, which is mostly of a sandy nature, being particularly heavy. A long, narrow block road is, however, now being constructed, and extends to a point 15½ miles North of Perth. It has already served to open up a large stretch of country. Provision has been made for the further lengthening of this main artery, and it is proposed to also construct a branch road leading from the vicinity of the 16-mile post towards Lake Pinjar, some five miles further on in a north-east direction.

"These extensions will tap two large and valuable pieces of unalienated land, which are well adapted for close settlement and extensive cultivation, viz., the reserve to the westward of Lake Mariginup and the more capacious one including Lake Pinjar.

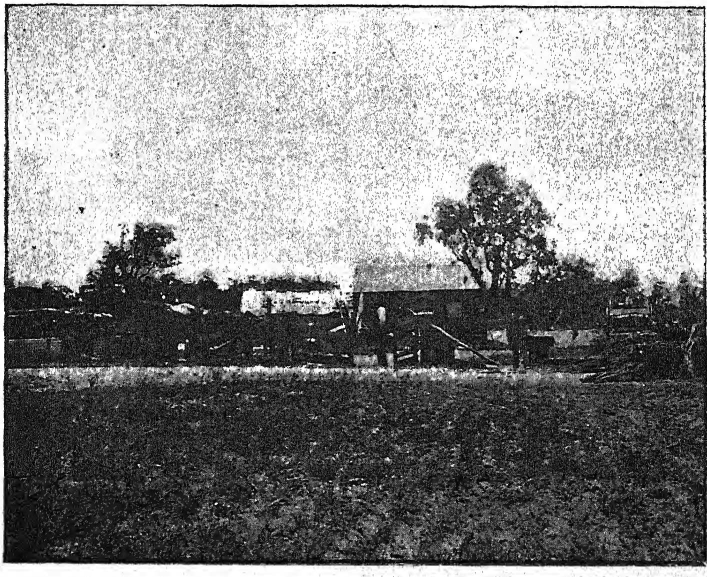
"The bulk of the country visited is of a sandy nature, and is now under banksia and stunted jarrah, with tuart gum wherever the coastal limestone formation outcrops.

"Now and again patches of swamp land break the monotony of the sand stretches; most of these have been taken up, and several have of late been partly brought under cultivation. They consist of circular or of oblong depressions, which in the wet winter months are mostly under water, and at present they are only used for summer cultivation. If drained, the period they are susceptible of being cropped could be much lengthened; but by reason of the configuration of the country, drainage would in many cases prove costly, and as one swamp could only be reclaimed at the cost of another this method would interfere with vested interests, and would not be applicable to the majority of the swamps in the locality.

"Hitherto, bulky garden crops and some patches of potatoes have been the only produce raised for marketing; the heavy cost of haulage and the time involved in carting the stuff to Perth have militated against more extensive cultivation.



Lake Coogee.



A Pioneer's Farm Yard (Lake Pinjar).

"As a rule, the settlers occupy more swampy land than they can cultivate during the season, and, as a consequence, large stretches of moist land susceptible of carrying crops are left unproductive and unreclaimed.

"Much good work has, in the face of the difficulties encountered in marketing produce, been achieved by those already on the land; they however recognise that the progress of the district chiefly depends on settlement, and recognise that its best interests would be safeguarded by limiting the area susceptible of being selected to smaller blocks.

"This, in connection with the two reserves already referred to, viz., those around Lake Mariginup and Lake Pinjar, offer special features for close settlement. They are of good size and comprise a large area of good land, abundantly watered.

"Lake Mariginup, one of the few deep water lakes of the locality, is particularly picturesque. It is oval in shape, one mile long by three-quarters of a mile wide. The water is quite fresh and apparently suitable for stocking with fish. It is only 17 miles from Perth and comparatively easy of access. The land surrounding it is a deep sandy loam, dark in colour, moist, and supports trees of large size, chiefly banksia, red gum, jarrah, tuart gum, blue or flooded gum, blackboys and paper bark.

"A couple of miles to the North of Lake Mariginup the track runs along the margin of Lake Coogee, which presents features common with many of the so-called lakes of the district. There the work of reclaiming the swamp has been taken in hand for some time, and the land has proved itself to be well suited for the cultivation of maize and other fodder plants, as well also as for potatoes and vegetables.

"Lake Pinjar is situated three miles to the north of Lake Coogee, or five miles from Lake Mariginup. It is a lake only by courtesy, as water never lies to any depth on it. The lake and the land in its vicinity offer special features for establishing a prosperous agricultural settlement. It is 24 miles from Perth, and seven miles, in a straight line, from the coast. In shape it is oblong, being six miles long and one mile and a half wide. The bottom of the swamp is firm enough to carry horses and implements at almost any time. The soil is of a peaty nature, and there are evidences of it having caught fire and smouldered in places when dry and spongy in the summer.

"This peaty stuff lies over a sandy bottom. I have not been able to ascertain whether there is a hard-pan underneath, as is evidenced in some of the swamps I have visited; but some of the settlers who have fenced off portions of the swamp land have informed me that when digging to a depth of about three feet for setting up corner posts, they did not strike any hard-pan. Such an impervious bed, however, must be present at some depth which remains to be ascertained.

"During a wet winter, the margin of the lake is an inch or two under water. Soft rushes grow over the whole surface, and bull rushes in a few isolated places. Here and there, small knobs covered with paper bark trees, gum trees, and blackboys stand out like so many islets upon the flat swamp, which is evenly graded, and dips about three feet from the margin to the lowest point of the trough or shallow depressions along the axis of the lake.

"On the eastern side fresh water springs now and again surge out of the ground, and that water feeds the swamp, where it spreads out over a large surface, and is lost by evaporation and by percolation.

"The margin of the lake consists of rich, damp, sandy loam, supporting a thick growth of gigantic blackboys, paper bark, red gums, tuart gums, and stunted jarrah. That zone varies in width from 20 to 25 chains.

"On the western side, there is less of this rich sand, the country being more broken, and consisting of limestone hills, which run parallel with the coast line. Well sheltered spots, suitable for vine and fruit-growing, are found on that side.

"In its present unreclaimed state, cattle do not do well when depastured without a break all the year round on that country, and become what is locally known as "coasty." When so affected, a change of pasture a few miles to the eastward, in the direction of the Swan and the hills, soon restores them to health. This affection appears to be one caused by excess of some substance contained in the native scrub which these cattle feed on, or to deficiency of some mineral salts essential to the well being of the animals. It is a fact worth noting that cattle which receive a supplementary ration or have access to the more succulent cultivated crops show no signs of wasting and debility.

"Pigs do remarkably well when turned out. Some which are foraging for themselves and are never artificially fed, keep in good condition and occasionally come up to the farmyard.

"I was shown some splendid crops of potatoes and rye. Fruit trees, more especially apples and Japanese plums, planted a few years ago, are growing with great luxuriance, and so do grape vines. I also saw test plots of white clover, Paspalum grass, millet and sorghum, which give evidence of doing well.

"The locality offers every promise of one susceptible of developing into a thriving dairy centre. Bulky crops of fodder can be grown in the winter, on the higher sandy loam around the lake, and in the summer months on the swamp itself. The surplus of these, cured at a small cost into ensilage could yield an abundance of nutritious fodder for feeding a large number of pigs and cattle. The application of phosphatic fertiliser helps the crops greatly on the newly turned land.

"By limiting the acreage susceptible of being selected to as much as a family could well cultivate, a score or more of farms could

Black-boy thicket and land recently cleared at Lake Pinjar.

Paper-bark thicket and land recently cleared at Lake Pinjar.

be carved out in the country now unproductive, and lead to the establishing of creameries, butter, cheese, and bacon factories.

"One feature of the locality which struck me greatly was the gigantic growth of blackboys (Grass Trees, *Xanthorrhœa*) around the lake, and I am told by the residents who have been out kangarooing over that country that thick jungles of them occur here and there for miles. A snapshot of one of these blackboy thickets I beg to attach to this report. Their growth varies from one to two feet in diameter, and their height from three feet to 18ft. A demand has of late sprung up for the resin yielded by the plant, and it appears that whilst this substance has for a long time been esteemed for the manufacture of varnish, it has lately been discovered that it is one from which picric acid can with comparative ease and with profit be manufactured. The agricultural Chemist of the Department is at present engaged conducting an investigation on this substance, which there is reason to believe will be in large demand for the manufacture of the powerful explosives which of late have, in many cases, supplemented gunpowder.

"I am given to understand that the extraction of that resin occupies a number of men on Kangaroo Island, on the coast of South Australia, and should it be so, there is every indication that the profit derived from extracting the resinous matter from blackboys, such as occur around the district visited, will, to a great extent, pay for the clearing of the land and prepare it for the cultivation of crops and herbage and the raising of stock."

AGRICULTURAL LECTURES.

By A. Despeissis.

FOURTH LECTURE.

Tillage is one of the means we have of "unlocking" the unavailable elements of plant food in the ground and making them available for the crop.

It improves the physical condition or "texture" of the soil. Incidentally it favours "chemical reaction" in the soil as well as "biological conditions," which independently or severally exert a beneficial influence on vegetation. Tillage is best effected by means of ploughing, harrowing, rolling, and hoeing, to bring the ground to a proper state to receive the crop; to destroy weeds and loosen the soil, and maintain it in a good state of cultivation after the ground is under crop. Tillage or cultivation is spoken of as deep or shallow, according as the soil is loosened at a depth of 6in. or more, or only stirred two or three inches.

Tillage improves Physical Texture of Soils and deepens the feeding ground of crop. The natural tendency of roots is to grow downwards in as symmetrical a form as the branches above ground; it thus follows that by deepening the soil the roots have a better chance of spreading uniformly around. For that reason, by deepening the soil and improving tilth more plants can be grown on a given area.

Thorough cultivation also equalises the conditions of moisture and temperature, and makes them more uniform throughout the growing season.

On a small scale tillage also continues the natural weathering process by which soils are produced out of the original rocks.

Tillage hastens Chemical Action in the Soil.—As air gets access to the freshly-cultivated earth, chemical actions are set up or are made more active. Minerals become oxidised, and the organic constituents of the soil undergo decomposition and crumble down. This action is quickened by the presence of warmth and moisture; also by the shuffling of particles of soil consequent upon cultivation. Then new combinations result, some of which are more soluble. Plant food is unlocked and rendered available; in fact, tillage in itself is "manure."

Tillage favours Biological Changes in the Ground.—Our knowledge of the likings of those useful micro-organisms which abound in every fertile ground tells us that whatever maintains the ground in a stirred, moist and warm state must have a beneficial influence on their well being.

Tillage by Deep Working Tools.—The "plough" is the typical implement used for deep cultivation. It aims at turning the crust of the ground, which is by its means cut into ribbons in order to pulverise it, to deepen the soil, cover weeds and other vegetation, to break up the "hardpan" where it occurs. Ploughing also leaves the ground warm and dry, and in a proper state for the weather to act upon it. Many transformations has the plough undergone in its evolution from a mere pointed stick hardened in the fire to the modern implement which can at will either turn the soil upside down, burying the weeds altogether, or stand the sod edgeways, or cause it to crumble fairly smooth without crest or ridge.

Ploughing Pulverises the Soil.—The old fashion long mould-board plough turns a ribbon of soil evenly and entirely. In order to achieve the pulverisation of the soil a different type of plough is used: one with a short sharp mould-board such as the "Oliver" plough. This implement, with a mould-board with an outward curve, lifts the soil and causes it to crumble, leaving the ploughed land with an appearance of a pulverised surface instead of long, neat, uniform furrow slices.

Ploughing Deepens the Soil.—If set much deeper than the previous year an amount of raw earth, which is undesirable, is

turned up by the plough. Yellow sub-soils owe their colour to immature ferrous silicate which, until aerated and turned into "red ferric silicate," is inert as regards its actions as plant food, or is even prejudicial.

Ploughing to cover Weeds, etc., should be done whilst the soil is still moist to facilitate their quick decay. This is best done in the early spring by means of a plough turning a broad and deep furrow slice which should be turned right over, so as to completely cover the weeds.

Ploughing to break up the Hardpan.—By "hardpan" is meant a thin layer of impervious earth which is formed at a small depth below the surface. This hardpan is as natural as those consisting of silicate of lime or of silicate of iron not uncommonly found in swamps, or it may be artificially produced as the result of ploughing at the same depth year after year, the sole of the plough gliding over the same glazed surface it ran over the previous season. These hardpans constitute an obstruction against the downward growth of roots or prevent rainwater penetrating to any great depth, a small portion only wetting the surface and the rest running to waste. It also creates a screen which prevents the hair-like or capillary tubes in the earth from drawing moisture from below in times of drought.

FIFTH LECTURE.

Tillage by Surface-working Tools. — Deep cultivation having deepened the feeding range of the roots allowed the easier penetration of moisture and of air, and having covered weeds and other undesirable vegetation, it becomes imperative to maintain the soil in good tilth. This is done by surface-working tools, such as harrows, cultivators, clod-crushers, rakes, etc. The object of this surface cultivation is: To make a suitable seed bed, to cover the seeds, to pulverise the ground, to establish and maintain an earth-mulch, to tear up and drag to the surface roots and weeds, and cleanse the land.

Whatever produces that earth-mulch secures all the objects mentioned. Thus a screen is created which prevents the moisture rising to the outer surface by capillarity to replace that which has evaporated or has been utilised by plants. Weeds and unchecked capillarity are the two great wasters of the soil moisture. Surface cultivation by tearing up the weeds and disturbing the second prevents that store of moisture escaping out of the ground. That moisture, holding plant food in solution, is thus conserved, and is only permitted to escape after passing through the cultivated plants for whose benefit it is conserved.

During the growing season, which are also the dry months in Western Australia, whenever this capillarity reaches the surface it becomes necessary that this soil mulch or any artificial mulch which may happen to have been used, be renewed or repaired, and

to this end surface cultivation is an excellent way of effecting the desired result.

This is better attained by first causing the clods to crumble after ploughing by means of some tearing implement like the spading harrow or even the spiked clod-crusher. Some lighter implement, like the Acme harrows or the Zig Zag harrows are then run to give a smooth surface to the cultivation.

The earth mulch is not uncommonly destroyed by rains, as it also is by irrigation, the wet surface baking hard after drying. Whenever this occurs, surface cultivation must be applied and renewed. In order to be productive of good, it is essential that this operation be done in good time, as, if delayed until the soil moisture has been dissipated through careless management, no amount of cultivation will restore that moisture to the ground. Summer tillage should be shallow, as deep cultivation would not only allow the hot air to penetrate the soil and the moisture to escape, but it would also injure many of the roots and rootlets of the crop when they are in an active state.

Very many kinds of harrows have been employed to effect this shallow cultivation, from branches of trees of olden days to our modern harrows made of iron framework and iron tires.

Tillage by Compacting Tools are often called into requisition to "consolidate" light and porous ground after ploughing and harrowing. These consist of rollers, the heaviest of which are called clod-crushers, and are used to reduce large clods to a size more convenient for treating with other implements, and also to bring the clods into a condition more susceptible to the influence of the weather.

Rollers are made of two or more sections to lessen the strain on the horse when turning at the end of the field, and avoid the danger of tearing up part of the ground and crops.

The Objects of Rolling are to crush clods expeditiously when the ground is in such a condition that it will crumble; to smooth and compress the surface land for the seed bed, thus drawing capillary water towards the seed and hastening germination; to compact and solidify soils which are otherwise too loose and open; to facilitate the free working of other tools, and to facilitate marking out the land. As rolling by compacting the soil favours the rising of moisture by capillary action, it becomes essential to secure the storage of that moisture inside the soil to lightly work the pressed surface with harrows, and so renew the earth mulch. If the ground is under seed at the time, it may be necessary to wait until the young plants are firmly anchored to the ground by means of their roots; but if the seed is in lines the scarifying can commence as soon as the rows are sufficiently marked.

Fallowing.—This is yet another means we have of unlocking plant food from the soil and making it available. The amount of available plant food in the ground may be said to be a fluctuating quantity, and varies with the amount removed by the crops and

that added to the soil by the process of natural disintegration and decomposition of matters in the soil. Before fertilisers were known it was usual to cultivate a field and then allow it to rest, or fallow it in order to accumulate sufficient plant food for the next crop. Dry climates are the only ones where bare fallowing can be carried out with success. In damp or wet climates bare fallowing always results in the loss of nitrogen which would be washed out of the ground. In order to avoid this, catch-crops are sown, the roots of which retain the soluble nitrates and prevent to a very large extent their being leached by the rains. Fields under bare fallows are apt to be gullied by rains and denuded by winds, on the other hand, fallowing clears the land of weeds, allows early sowing, and in dry climates fallowed land is less apt to suffer from droughts in the autumn.

DRAINAGE.—On all land that is not naturally dry and sound, artificial drainage is the foundation of good husbandry. Sandy soils by their texture, certain soils by their slopes, and others by the porous nature of their subsoils, are said to be naturally drained. The signs that land is in need of drainage are very apparent, they are :—

1. Water accumulates in puddles on the surface after heavy rains.
2. The ground is so sloppy and slushy after rains that the mere treading on the surface causes men and beasts to sink into it.
3. A green slimy fungus growth showing on the surface, and such weeds as rushes, sedges, tussock-grasses, and other marshy plants grow naturally.
4. In cultivated fields the crops are poor in patches, and in the spring look thin, weedy, and sickly yellow.
5. Plovers and other insectivorous birds commonly frequent land that needs drainage.

Ill-drained soils are cold when the free water is allowed to remain stagnant near the surface, and are injurious to plant life because that stagnant water :—

1. Limits the feeding space of roots, which shrink from the excessive wet or rots in it.
2. Makes the soil cold in spring, by reason of the water slowly evaporating, which uses up a large amount of heat and robs the plant of the warmth it requires.
3. Occupies the space that should be filled with air.
4. Causes plant food to be locked up, and prevents the action of micro-organisms.
5. Dilutes the plant food in solution and causes the rainfall to be carried off largely by surface drainage.

It is commonly supposed that land is drained simply by removing the excess of water which is making it wet; but much

more than this is accomplished when the soil is properly drained. The draining off of water allows the air to penetrate the soil and assists in nitrification. Without drainage no other improvement can be effective and no other system of cultivation can be successful. Hence it follows that all water-logged land, as well as that which is stiff or too wet, must be subjected to a thorough drainage as a first operation.

SIXTH LECTURE.

Drainage Continued.—The advantages of well drained soils, are:—

1. It equalises the temperature of the soil and tends to raise it.
2. Roots penetrate deeper, and so a greater area is opened for the supply of plant food.
3. By allowing the air to penetrate the soil, filling up the places occupied by water in bad or undrained soils.
4. The admission of the oxygen from the air through the soils tends to oxidise injurious matter.
5. Moving water washes away any excess of saline matters or harmful solution of salts of iron, and prevents alkaline salts rising from below.
6. Drainage makes crops ripen earlier, therefore fallows are less necessary. It lengthens the seasons and enables the farmer to sow earlier or later as may suit him.
7. The ground is made more healthy, crops are freer from blight, liver-fluke, and many other parasitic diseases, are made less prevalent on well drained soils.
8. It does not rob land of water but rather enables the rainfall to penetrate to greater depths, instead of running over the surface and being wasted.

Drainage is effected by several methods classified under two main systems: open drains and underground drains.

Open drains comprise arterial or trunk drainage and surface drains.

Arterial drainage embraces a comprehensive scheme for draining the surface of a large area of country. The size of these drains depends upon the slope, the less the gradient the greater the capacity of the drains. In order to keep it clear of silt, a gradient of at least one foot per mile is necessary. Small drains or ditches require at least eight feet per mile.

In order to avoid the erosion of the sides and against the banks being undermined by the running water, the sides of the drain are cut at an angle which varies according to the nature of the soil. In sandy soil an angle of 45° is required, in loamy soil 60° to 70°, whilst clay may be cut almost perpendicularly.

Surface drainage is a ready means of ridding the surface soil of stagnant water. It is chiefly used for draining boggy land, and often prepares the way for deeper drainage. For draining a slope, drains should be made almost at right angles with the fall of the land. In the case of a wet, porous soil overlying an impervious bed at a shallow depth, the trench should be cut right through the impervious bed, and as a result the level of the water will be lowered and the surface drained.

Drainage of Retentive Soils and Deep Drainage.—Some soils, such as stiff clay, are quite differently treated. They are composed of very fine particles, and when wet are sticky and allow water to pass through them very slowly, and it more often forms into puddles on the surface. There is no fluctuating water-table in this soil, the level of which might be reduced by a drain. It must be attacked in a different way, and this is done by "deep drainage," the advantages of which are—

1. Teams and implements can work much easier and without obstruction.
2. Weeds or rubbish have no chance of establishing themselves on the side of open drains, but are swept away in the process of cultivation.
3. There is no surface wash, erosion of soil, or loss of fertilisers.

The method consists in opening deep trenches or ditches, filling them partly with brushwood, logs, stones, or setting drain pipes in them, and covering them up with the soil thrown out when excavating.

The depth at which the generality of soils can be most profitably and effectually drained varies from three to four feet. The more clayey the soil the deeper the drain should be made, until about four feet is reached.

The minimum depth of a drain should be 30 inches, while the maximum should not exceed four feet. They must be deep enough to be out of the reach of roots of growing crops. If too shallow, the water will run directly into them without benefiting the soil in the first instance by its fertilising power. The usual thing to consider is to what depth you cultivate the land; 18 inches should be allowed for crops, an additional eight inches must be allowed below this, and the bottom of the drains must be another 10 inches, making 36 inches or three feet in all.

The first thing to attend to before draining is to decide upon the outfall, after which a plan must be made which will embrace the whole of the workings, so that in case anything goes wrong the affected part can be at once got at without unnecessary work or delays. Operations should always be commenced at the lowest part of the area to be drained; the main drain should be a few inches deeper than the lateral ones or branch drains. These branch drains should be laid at right angles, but must connect with the

main drains on a slant like the bones in the back-bone of a fish. Branch drains must not enter main drains opposite each other, but at alternate distances.

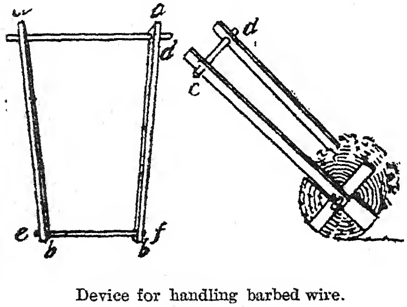
The cost of thorough deep-draining will vary from £7 to £10 per acre, but in considering the cost, the grower should bear in mind that fertile, well-drained land will increase in productiveness by 20 to 30 per cent.

After draining has been efficiently laid out it is very important that the drains are kept in a thorough state of repair. One of the principal causes of defects is the sagging of the drains, the gradient not being sufficient, the pipes being too small, or the displacement of the tiles or pipes—the latter is sometimes caused by the roots of trees, which shows that the drain was not deep enough.

In order to prevent sagging, boards should be laid under the pipes in order to keep them in their position. Another cause of stoppage is sometimes due to an accumulation arising from the oxide of iron in the soil, which becomes deposited in a muddy sediment in the drains; this is avoided by digging traps at intervals, some ten or twelve inches lower than the drains and their position marked so that they can be readily emptied at any time.

HANDLING BARBED WIRE.

With the device shown herewith is very much easier than by the old way. It saves clothes and lacerated hands, and works well on uneven ground and through brush. Two strips, *a-b*, 1 inch by $2\frac{1}{2}$ inches wide and 30 inches long, are used. Two inches from the end of each strip an inch hole is bored. Two round sticks 1 inch in diameter are necessary. Hard wood broom handles will serve the purpose. The one shown at *c-d* should be 2 feet long, while *e-f* is 20 inches long. The handle, *c-d*, may be fastened by driving a nail through the sidepiece, but *e-f* should be keyed so it may be removed from the frame and passed through the spool of wire as shown in the drawing. The wire is easily handled by drawing it over the ground with this simple device.—*American Agriculturist.*



Device for handling barbed wire.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

By Robert Hall.

PART IV. *(continued).*

BIRDS INSECTIVOROUS AND FRUGIVOROUS.

[More or less Useful.]

Spiny-Cheeked Honey-Eater.

Acanthochæra rufigularis, Gould. (*A-kan-tho-ke'ra ro-fi-gu-la'ris.*)

Akantha, a spine (a thorn); *chæra*, representing a genus of perching birds (Passeres); *rufus*, red; *gularis*, pertaining to the throat.

Acanthogenys rufogularis, Gould, "Birds of Australia," fol., vol. iv., pl. 53.; "Key to Birds of Australia," Hall, p. 44, 1899.

Geographical Distribution—Areas 9, 7, 6, 3.

Key to the Species.—Throat to upper chest, rufous; abdomen white, heavily lined with brown; bristle-like feathers on cheeks and beneath ear coverts white; nostrils longitudinal and operculated. Total length, 10 inches.

In number of species the largest family of birds in this continent is the Honey-eating one. That eminent naturalist, Mr. John Gould, was very happy in claiming for the *Meliphagidæ* the place in the avi. fauna of Australia held by the eucalypti in the flora. In point of fact these families are particularly associated in interests of each other, one in so far as cross-fertilisation is effected, and a food supply is provided to the other. Nature provides the nectar pots for a dual purpose.

It should be interesting to know that the 88 known species of Silver-eyes (*Zosterops*) are either of the *Meliphagidæ* or closely related to them. They have Honey-eating tongues.

Of Honey-eaters with generally recognised definition there are some 150 known species confined to the Australian and New Zealand regions, though with scanty representation in the latter. With one exception they are altogether placed in these areas, and it is not so very surprising that this wanderer should get from Lombok to the island of Bali; rather the wonder is that the north-west boundary of geographical range should be faithfully kept by the birds. If you hold the view that the Silver-eyes should form a part of the family, then the two regions named will lose the family as one peculiar to the areas, for it then starts its most western line of habitation in South Africa, working northward to China, and south from there to New Zealand, closely traversing the intermediate countries. If we include the Silver-eyes, of which there are six species in Australia, we find the continent, with Tasmania, totals 75 species.

Our State has 41 species, of which 10 are found only in the extreme north. Beyond the 41 species several are Central Australian, which will include a small portion of our most easterly territory. Figures would then show this family to be in keeping with the rich honey-bearing flora of our State.

One fault of the spring-cheeked species is the manner it has of rubbing its rough tongue along such fruit as peaches. By that means it gets below the skin, and damages the fruit. Apart from this habit it is insect-eating to a large extent. It is generally to be found in the dry portion of the country.

Nest.—Cup-shaped and suspended; made delicately of grass and lined with wool.

Eggs.—Generally two to a sitting. Ground colour buff, with chestnutty brown and greyish spots upon it. Length, 1 inch: breadth, 0·75 inch.

Yellow-throated Friar-Bird.

Philemon citreogularis, Gld. (*Fi'le-mon sit-re-o-gu-la'ris*).

Philein, to love; *monos*, single; *citrus*, lemon yellow coloured; *gularis*, pertaining to the throat.

Tropidorhynchus Citreogularis, Gould, "Birds of Australia," fol., vol. iv., pl. 60; "Key to Birds of Australia," Hall, p. 45 (1899).

Geographical Distribution—Areas, 8, 7, 6, 3, 2, 1.

Key to the Species.—General appearance, brownish grey; under parts, whitish; cheeks only and region round eye are bare, in very old birds, also part of crown next to eye is bare; culmen, not humped, 1·5 to 1·2 inches; wing, 5 to 5·2 inches; tail, 4·1 inches; tarsus, 1 inch. Young birds have yellowish throat; face, blackish and not so mealy as in adult.

For a bird 12 inches in length this is very near if not the plainest of them.

Not so much a "friar" in appearance as the Eastern form, though it is very much like it in habits.

With an undulating and powerful flight, it is recognised while passing over trees from one part of the forest to another. In a tree it has the habit of swinging itself into grotesque postures, the curved and powerful claws enabling it to cling very much as it wishes; with one foot if necessary. Take hold of a living specimen and allow one foot to test the value of its muscles and claws upon the hand. The call of the bird as it perches upon a topmost bough of a lofty "gum" is peculiar and discordant. Berries, insects, and eucalyptus pollen of the dry areas form the ordinary diet.

Its habitat is in the North and North-West and doubtless upon the eastern boundary of the State. I am not aware of any friar-bird having been found in the South-West.

Nest.—Suspended from a forked branch; composed of grasses and bark with finer grasses within.

Eggs.—Three to a sitting; ground colour pale salmon, with blotches of pale chestnut, purplish grey and slatey grey. Length, 1 inch; breadth, 0·75 inch.

Great Bower-bird.

Chlamydodera nuchalis, J. & S. (*Klam-i-dod'e-ra nu'ka-lis.*)

Chlamus, a mantle; *dera*, neck; *nucha*, nape; *alis*, pertaining to.

Chlamydera nuchalis, Gould, "Birds of Australia," fol., vol. iv., pl. 9; Key to "Birds of Australia," Hall, p. 22 (1899).

Geographical Distribution—Areas, 9, 8, 1.

Key to the Species—

Male.—General appearance grey; band of bright lilac on nape; upper surface mottled with ashy-whitish or white tips or bars at ends of feathers; throat and sides of body perfectly uniform; head uniform; lateral subterminal notch on upper mandible.

Female.—No lilac band; flanks perfectly uniform or with obsolete bars of dusky under tail; coverts whitish with narrow bars of dusky brown; head uniform.

All the bower-birds are remarkable, with habits equally so, and quite peculiar to them. Imagine birds having properly prepared play houses in and around which they race and gamble for an hour at a time. Such a sport house is an unlabelled natural history museum. About its entrances lay bleached bones; reading better perhaps as osteological specimens. Further along are snail shells, and scarlet quondong fruit, while decorations of art, in pottery and china, are surely shown with any available coloured pieces that be within a mile of the house.

The construction of this strangely-built playhouse is after the pattern of a drain pipe, divided lengthways, with one-half placed upon the ground on a base of dry twigs and small sticks.

By imagining the two-feet long pipe to be roughly built of dry, short twigs and open along the roof, we will have some idea of the run. Within are placed stones, occasionally, to keep the structure firmly on the ground. This surely shows high instinct of reasoning power. Added to this bower, well hidden beneath the foliage, are the decorations named. It is the so-called baby cradle of the aborigines, and is one of the most wonderful pieces of bird-architecture known.

It has reached the highest standard of perfection in that of the *Amblyornis* (Gardener Bower-bird) of New Guinea.

Every animal has some way of enjoying itself, and this is the one chosen by the Bower-birds, besides being one of the means employed in sexual selection.

This species, like the other three in our State, is shy, and seldom indicates its nest. This is built high in a small tree away from its bower.

Some people say this bird is the greatest pest we have if the garden be near the break of scrub to which they mostly resort.

Though it is a suspicious and extremely wary bird, it is a bold one, and will dash into a fruit tree that is "almost under your nose." At the same time it calls out in a very brave way, almost impudently; yet the slightest hostile movement will cause the bird to vanish like magic. I should think such a cute personage makes a mistake when visiting a fruit tree to use loud, defiant cries, sometimes its own notes, but often a bad imitation of a common bird in the neighbourhood.

Their food is partly composed of insects, but in the season of what may be growing in the garden, such as tomatoes and chillies; the latter, if swallowed whole, not being hot. In Queensland the small fruits of a bright colour, as guavas, are warred upon, which is reciprocated by the owners.

Yet it is an unrighteous act to judge a bird upon one kind of evidence. A personal friend of the writer, with a Bower-bird in captivity, had a garden which, three months ago, was badly infested with white slugs. Three months of freedom and one wing cut reduced the pest absolutely to abiding "citizens"; as a matter of fact, reduced them to visitors only.

Nest.—Open, made of twigs and lined with finer twigs; placed well up in a tree.

Eggs.—Clutch one, probably two; inclined to oval in form; surface glossy; colour greyish green; moderately streaked or smeared all over with olive brown or umber, with underlying marks of dull grey: singularly marked. Length, 1·69 inches; breadth, 1·11 inches (A. J. Campbell).

ORIOLE.

Oriolus sagittata, Gld. (*O-ri'o-lus saj-e-ta'ta*).

Aureolus, golden; *sagitta*, an arrow.

Oriolus affinis; preserved specimen, the Museum, Perth.

GEOGRAPHICAL DISTRIBUTION—Areas 8, 4, 3, 2, 1.

KEY TO THE SPECIES.—Breast streaked; abdomen white, broadly streaked with black; upper surface olive to olive green; lores feathered; small white spots at tip of tail; bill with a notch in the upper mandible; nostrils placed well in front of the base of bill and quite bare; iris scarlet (in adult). Total length, 10 inches.

Mr. Gilbert speaks of the note as loud, distinct, and very unlike that of every other bird he had ever heard, the sound usually uttered being a loud, clear whistle terminating in a singular, guttural, harsh catch; but in the cool of the evening, when perched among the thick foliage of the topmost branches of the eucalypti and other trees, it pours forth a succession of very pleasing notes.

It feeds in a flock of five to twenty in number, upon wild fruits. Cultivated fruits will offer tempting invitations when opportunity arises.

There is a divergence between the Orioles of the mainland and those of the Malay Archipelago, as noted by Mr. Wallace and

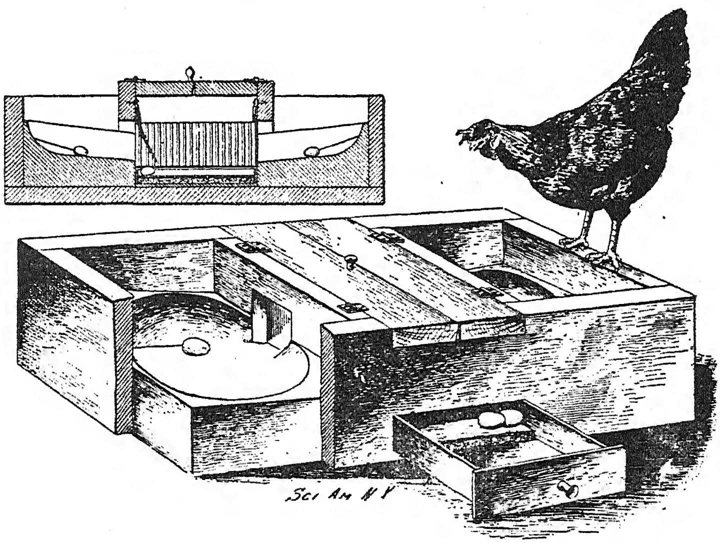
interesting as a case of protection. The two species of the islands unconsciously mimic the Leatherheads (*Philemon*) and thus lead birds of prey to believe they have to deal with the pugnacious Leatherhead instead of the harmless bird under notice.

Nest.—Suspended from a swaying branch; open; made of grasses and leaves; lined internally with soft material.

Eggs.—Three to a sitting; ground colour, cream with umber and brown spots above and lilac marks appearing as if below the surface. Length, 1·2 inches; breadth, 0·8 inches.

AN EGG COLLECTING NEST.

The nest illustrated is intended automatically to collect eggs which have been laid, in order to prevent a hen from eating them. The nest is divided into three compartments—a central storage chamber and two egg-laying compartments at the side of the storage chamber. The egg-laying compartments are inclined, and communicate with the central storage chamber by means of openings



closed by flaps. An egg which has been laid will roll down the incline, push aside the flap, and drop into the cushioned storage compartment, from which it may be removed by means of a drawer. The usual nest-eggs are provided, fastened in place, however, so that they cannot follow the course of the eggs that have been laid.—*Scientific American.*

REPORT ON CEREALS GROWN AT HAMEL EXPERIMENTAL PLOTS.

SEASON 1901.

HIGHLAND PLOTS A.—This land has been in cultivation for a few years, under various crops.

Aspect: slight fall Westward and towards the brook, which gives a very good drainage to these plots. Soil consists of a light loam of good quality; subsoil, ironstone gravel. Season: The rainfall was rather heavy in winter and light in the early summer, but taken as a whole, good. Sowing: All the varieties were sown alike, thinly in shallow drills one foot apart, the manure applied in the drills with the seed. Manure composed as follows: Four parts of superphosphates, 1 part sulphate of ammonia, 1 part sulphate of potash, used at the rate of 2cwt. per acre; cost, about 20s. per acre. Yields: These are taken from 66 feet of average drill on each plot, and threshed and weighed separately. The yield per acre calculated from the results of these test drills. They are reliable in showing the productiveness of each kind under the above treatment. The yield for Garton's new oats and barley are, from the actual weight of clean grain on each whole plot, 1-40th of acre.

WHEAT, TRESOR (Vilmorin).—French seed, sown 22nd May; soil moist and in good condition; germination even; growth at first slow, habit upright, fairly level and healthy; straw of good quality, rather coarse, stands up well, flag broad, slightly rusty; height of plants, four feet; ripe 14th December; heads beardless, good form and well filled; grain of medium size, colour deep reddish yellow, shells out easily when fully ripe, said to be of excellent milling quality; yield very fair, at the rate of 18 bushels per acre. This variety matures mid-season; would not be suitable for culture in dry districts; good for hay.

WHEAT, GALLAND'S HYBRID (Vilmorin).—French seed, sown 22nd May; germination strong and fine; growth slow, but healthy and robust; straw strong, of good quality, stands up very well; foliage clean, free from disease; the plants do not stool out much; height of plants, five feet, very neat and level; ripe 18th December; heads bearded, thick set, and well filled, most of the beards drop off when fully ripe; grain white, very large, plump and soft; yield very heavy, at the rate of 35 bushels per acre. This is a hardy prolific sort, which should prove useful for poultry feeding; late to mature, of slow growth, unsuitable for dry districts.

WHEAT, SILVER KING (South Australian sort).—Local seed, sown 23rd May; germination quick and even; growth vigorous and healthy; straw of fair quality stands up well; good variety for stripping, free from disease; height of mature plants, five feet, level; ripe first week in December; heads beardless, rather thin, four to

five inches in length, well filled; grain of good size and quality, colour pale yellow; yield good, at the rate of 26 bushels per acre. Productive second early wheat; should do well in early districts.

WHEAT, TOBY'S LUCK (Farrer, N.S.W.).—Local seed, sown 23rd May; germination very strong and even; growth rapid and robust, habit upright. At first this sort looked very fine; but at the end of winter and early spring became badly attacked by a yellowish leaf fungus, which killed or weakened at least half of the plants. Straw of fair quality, rather liable to fall over; height when mature, four feet; ripe 20th November; heads beardless, of good size and form, well filled; grain white, large and showy; yield fair, at the rate of 16 bushels per acre. This is an early wheat of remarkably quick growth; although not suitable for the locality, it may prove of value in dryer districts.

WHEAT, YELLOW BRIQUET (Vilmorin).—French seed, sown 24th May; germination somewhat slow and uneven; growth healthy, very slow; straw of fair quality, free from disease, stands up well; height of plants when mature, four feet, level and even; ripe late, 27th December; heads beardless, rather short, two and a half inches in length, well filled; grain of good quality, medium size, plump, colour bright yellow; yield fair, at the rate of 16 bushels per acre. This is a distinct variety, good for cool and late localities; matures too late for warm districts.

WHEAT, LAMBRIGG WHITE LAMMAS (Farrer, N.S.W.).—Local seed, sown 24th May; germination very even; growth vigorous and healthy; straw stands fairly well; height of mature plants, four feet six inches; ripe 14th December; heads beardless, of good shape, four and a half inches in length, well filled; yield good, at the rate of 27 bushels per acre; grain white, large, and heavy; good milling quality. This is a really good mid-season wheat, well adapted for culture in the coastal districts, suitable for either hay-making or milling grain.

WHEAT, MEDICK (Farrer, N.S.W.).—Local seed, sown 25th May; germination even; growth strong and healthy, except a few plants in patches attacked and spoiled by the leaf fungus; straw good and firm, does not lodge; height of mature plants, four feet six inches; ripe 12th December; heads beardless, three and a half inches in length, good shape, square tips, well filled; grain large, pale yellow, of good quality; yield good, at the rate of 22 bushels per acre. Useful and productive second early variety.

WHEAT, RANJIT (South Australian sort).—Local seed, sown 25th May; germination even; growth free and robust; straw clean, free from disease, rather slim and weak, falls over badly in windy weather; height when mature, four feet, level; ripe first week in December; heads beardless, long and thin, four and a half inches, well filled and holds the grain well; grain of good size, pale yellow, plump, and good milling; yield fair, at the rate of 18 bushels per acre. This wheat should be a good one for trial in the early districts.

WHEAT, 44A LAMBRIGG AUSTRALIAN TALAVERA (Farrer, N.S.W.).—Local seed, sown 27th May; germination good; growth robust and healthy; straw of fair quality, stands up fairly well, clean and free of disease, few slightly rusty on flag; height of mature plants, five feet, level and neat; ripe 12th December; heads beardless, three and a half to four inches in length, good form, well filled; grain large, pale yellow, plump, good milling quality; yield very good, at the rate of 28 bushels per acre. This is a good mid-season sort for hay or grain in the coastal districts.

WHEAT, MAJESTIC (South Australian variety).—Local seed, sown 27th May; germination even and good; growth strong and healthy; straw of fair quality, stands up well, height when mature four feet three inches, level; ripe 12th December, heads beardless, three inches in length, well filled; chaff pale brown in colour; grain light yellow, small and plump; yield good, at the rate of 20 bushels per acre. This appears to be a promising new wheat worthy of trial in the earlier districts.

WHEAT, SULLIVAN'S PROLIFIC.—This variety appears to be identical with the well-known Steinwedel local selected seed; sown 28th May; germination good; growth quick and vigorous; straw, thick and coarse; does not stand up well, and liable to rust and other diseases; height when mature, four feet, fairly even; few patches attacked by the leaf fungus; ripe, 5th December; heads beardless, of good form, square tips and well filled; shells easily when fully ripe; yield fair, at the rate of 18 bushels per acre; grain pale yellow and plump; wheat of fair quality for the earlier districts, not very profitable to grow here.

WHEAT, BRODIE'S PROLIFIC (South Australian variety).—Local seed, sown 28th May; germination good and even; growth, vigorous and healthy; straw of good quality, stands up well; height when mature, five feet, level and neat; ripe 10th December; heads beardless, four inches long, good shape and well filled, holds the grain very well; grain medium size, plump, pale yellow, good milling quality; yield good, at the rate of 25 bushels per acre; this is a really good second early wheat.

WHEAT, EARLY HAMBRIGG (Farrer, N.S.W.).—Local seed, sown 29th May; germination good; growth rather weak and uneven; some portions of this plot were badly attacked by the leaf fungus in the early spring; straw weak, falls over badly; height when mature, four feet; ripe 6th December; heads beardless, three inches long, good shape and well filled; grain white, small, fairly plump, said to be of superior milling quality; yield rather light, at the rate of 14 bushels per acre. This variety did not give good results here this season.

WHEAT, ALLORA SPRING, IMPROVED (Victorian selection).—Local seed, sown 29th May; germination fine; growth uneven and weak; straw poor, falls about greatly; many plants attacked with the leaf fungus; height when mature, three feet six inches; ripe 5th December; heads beardless, rather small; chaff pale brown;

grain white, small and plump; fair milling quality; yield poor, at the rate of 12 bushels per acre. This variety is not adapted to this district, would give better returns in drier districts.

Wheat, Australian King (Marshall's South Australian variety).—Local seed, sown 30th May; germination even and fine; growth vigorous and upright, very healthy and clean; straw good, firm, stands up well; height of mature plants, four feet six inches, level and even; ripe 10th December; heads beardless, four inches long, nice form, well-filled; grain medium size, yellow and plump; chaff brown; holds grain well; yield first class, at the rate of 30 bushels per acre. This is a distinct and prolific second early wheat.

Wheat, Bordier's Hybrid (Vilmorin).—French seed, sown 30th May; germination rather slow but fairly even; growth slow but healthy; straw good, stands up well; height of mature plants, three feet nine inches; ripe 20th December; heads beardless, rather small, about three inches in length; grain medium size, yellow and plump; yield fair, at the rate of 16 bushels per acre. This is a late variety, would not be suitable for early districts.

Wheat, Fife Essex (Farrer, N.S.W.).—Local seed, sown 31st May; germination even, growth strong and very healthy; clean, bright straw of excellent quality, and free from disease; stands up well; height when mature, five feet; ripe, 20th December; heads beardless, four inches long, thin and pointed, well-filled; grain white, small, plump, very good milling quality; yield good, at the rate of 26 bushels per acre. This is a really healthy and good wheat for the coastal districts; being late, it would not be suitable for dry localities.

Wheat, Marshall's No. 3 (South Australian variety).—Local seed, sown 31st May; germination even; growth, not very tall, but firm, and free from disease; straw, good; stands up well; height, when mature, three feet nine inches; ripe first week in December; heads beardless, of good form and fair size; grain yellow, plump, and good; yield good, at the rate of 20 bushels per acre. This is a clean, useful wheat, which should be suitable for the earlier districts.

Wheat, Stanley (Canadian seed, received from Central Experimental Farm, Ottawa, Canada).—Sown 3rd June; germination fairly even; growth good, healthy and free from fungus disease; straw slim, but of good quality; stands up well; sample somewhat mixed, a few of the plants have bearded heads; height when mature, 4ft. 6in., level; ripe second week in December; heads beardless, rather thin, 4in. in length; chaff brown; grain small, red, said to be a good strong flour variety; yield fair, at the rate of 16 bushels per acre.

Wheat, 113a (Farrer, N.S.W.).—Local seed, sown 4th June; germination even; growth healthy, but not tall or rank; straw fine, firm, stands up well; height when mature, 3ft. 6in.; ripe second week in December; heads about 3in. in length, few short beards on tips; grain small, pale yellow, and plump, of very good milling

quality; yield satisfactory, at the rate of 18 bushels per acre; neat compact variety, should be suitable for the early districts.

WHEAT, TARDENT'S BLUE (Farrer, N.S.W.).—Local seed, sown 5th June; germination even and fine; growth very robust and healthy; colour rich bluish green; wide flag; superior for hay; straw firm, stands up well; height when mature, five feet, very level and neat; ripe 15th December; heads beardless, four inches in length, well filled; chaff velvety; holds grain well; grain white, large, and plump; yield first rate, 27 bushels per acre. This is a splendid mid-season wheat, which does very well in this locality.

WHEAT, PRESTON (Canadian seed, received from the Central Experimental Farm, Ottawa, Canada).—Sown 5th June; germination weak and uneven; growth slow, but fairly even, and healthy; straw good, stands up well; height, when mature, four feet; ripe 15th December; heads heavily bearded, long and thin, not very productive; grain red, small, said to be a good, strong flour variety; yield light, 14 bushels per acre. This wheat so far is not very promising for cultivation here.

WHEAT, NO. 77 (Crossbred).—Local selected seed, sown 29th May; germination good and even; growth healthy and vigorous, free from disease; straw not very good, lodges badly when ripe; height of mature plants, four feet three inches; ripe 10th December; heads beardless, four inches long, well filled, holds grain well; grain white, very long, and of distinct shape; yield fair, at the rate of 20 bushels per acre. This wheat may give good results in drier districts.

WHEAT, LARGE HEAD, YELLOW (Vilmorin).—French seed, sown 6th June; germination good; growth slow, but healthy; straw firm and good, stands up well, not very tall, but level; height when mature, three feet nine inches; ripe 25th December; heads beardless, short and thick set, well filled; grain yellow, medium size and plump, said to be of good milling quality; yield medium, at the rate of 15 bushels per acre. This is a late variety, and so far not very promising.

NOTE: SPELTZ WHEATS.—These varieties are of a very distinct type, namely, *Triticum spelta*. Unlike the common wheats, the chaff does not shell off the grain by threshing. The grain is of superior quality for peeled wheat, not easily shelled and destroyed by birds, etc.; said to be very hardy and suitable for culture on land too poor for other varieties. I think that it may be suitable for hard cold climates. The results shown here this season are not good, and they are a long way behind the common wheats for hay or grain. The best sorts have been carefully selected, and are being tested again in the coming season.

WHEAT, SPELTZ WHITE BEARDLESS (Vilmorin).—French seed, sown 7th June; germination fairly even; growth very slow and weak; straw slim, free from disease, stands up fairly well; height when mature, two feet six inches, level and fair; ripe 25th December; heads beardless, long and thin; yield poor and light, at the rate of 12

bushels per acre, grain pinched. This is a very weak grower, and not suitable for culture in this locality.

Wheat, White Speltz (Vilmorin).—French seed, sown 8th June; germination slow, but fairly even; growth moderate, healthy, free from disease; straw fine, stands up fairly well; height when mature, four feet; ripe 15th December; heads bearded, medium size; grain thin and poor; yield light, at the rate of about 14 bushels per acre. Mid-season variety, does not appear suitable for this district.

Wheat, Speltz (Vilmorin).—French seed, sown 10th June; germination fair; growth slow and weak; straw of fair quality, stands up well; height when mature, three feet; ripe late, 25th December; heads very heavily bearded, long and thin; grain poor; yield at the rate of 12 bushels per acre. Very late variety, not adapted for this climate.

Wheat, Black Speltz (Vilmorin).—French seed, sown 11th June; germination even and good; growth moderate but healthy; straw firm and strong, stands up well; height when mature four feet, even and neat; ripe 25th December; heads bearded, of fair size, well filled; the chaff and long heavy beard are black, which gives this variety a very distinct appearance; yield fair, at the rate of 16 bushels per acre. Late variety, suitable for hay, although the beards would be objectionable. The best grower and most prolific of the Speltz tried here.

Wheat, Speltz Engrain Double (Vilmorin).—French seed, sown 11th June; germination good; growth healthy, but very slow; straw slim, stands up fairly well, partly solid and distinct; height when mature, three feet; ripe late, 25th December; heads bearded, small, and flat shape; grain in two rows like barley; yield light, at the rate of 12 bushels per acre. Poor variety, not suitable here.

Wheat, Speltz Grey Bearded (Vilmorin).—French seed, sown 12th June; germination fair; growth slow and weak; straw very slim, stands up well, height two feet, rather uneven; ripe late, 25th December; heads bearded, long and thin; the chaff and beards are dark grey; grain light; yield very poor, at the rate of 10 bushels per acre.

Rye, Summer Saxon (Vilmorin).—French seed, sown 6th June; germination very slow and uneven; growth healthy and fine; straw firm and nice, clean, stands up well; height five feet six inches, level; ripe 15th December; heads long and well filled; yield good, at the rate of 16 bushels per acre; grain plump and good. First class early varieties for straw or grain.

Rye, Giant (Vilmorin).—French seed, sown 1st June; germination somewhat slow and uneven; growth slow but healthy; straw very strong, stands up well, clean and fine; height when mature, five feet; ripe late, 30th December; heads large and long, fairly well filled with large heavy grain; yield good, at the rate of

18 bushels per acre. Late but hardy and prolific variety, useful for straw or grain.

NOTE: PLOTS B.—Lowland, old cultivation, aspect level, close to the brook, soil dark loam of good depth and quality, rather wet and sodden in winter, retains moisture moderately well during the summer months. Previous crop potatoes, for which the land had been well tilled and manured. The following plots were sown without any fertilisers being applied to the land. The results were very satisfactory; some of the wheats gave better results than on the highland, and others who dislike wet land less. The oats give the best returns on these low moist soils.

WHEAT, 172 (Crossbred).—Local selected seed, sown 3rd July; germination even and good; growth strong and vigorous, few spots of rust on the foliage; straw stands up fairly well; height when mature, four feet six inches, level and fine; ripe 10th December; heads beardless, four inches long, well filled; grain yellow, large and plump; yield satisfactory, at the rate of 25 bushels per acre. Good prolific second early variety.

OATS, EARLY RIPE (American variety).—Local seed, sown 4th July; germination good and even; growth very quick, strong, and healthy; straw not thick or coarse, would make good hay, rather weak and liable to lodge when fully headed; height when mature, five feet, level and neat; ripe early, last week in November; heads large, open, and spreading; grain fairly heavy, colour pale dun or light brown; yield very good, at the rate of 40 bushels per acre. This should be a really good sort to grow in dry districts, somewhat after the style of the Algerian, but of quicker growth, and matures earlier.

WHEAT, LAMBRIGG, WHITE LAMMAS (Farrer, N.S.W.).—Local selected seed, sown 4th July; germination fair; growth very strong and healthy; straw firm, of good quality, stands up well, would make good hay; height when mature, four feet nine inches to five feet; ripe 22nd December; heads beardless, four to five inches long, well filled; yield at the rate of 30 bushels per acre; grain white, large and plump, good milling quality. This is a really good wheat for the coastal districts for hay or grain.

WHEAT, BRODIE'S PROLIFIC.—Local selected seed, sown 4th July; germination good; growth fairly healthy, but rather patchy, does not appear to do well on the low land; straw fair, stands up well; height moderate, three feet six inches to four feet; ripe 19th December; heads beardless, of good form and size; grain pale yellow, medium size, of good quality; yield at the rate of 18 bushels per acre. This plot did not give first-class results; not equal to the same wheat on the higher land.

WHEAT, JADE (Farrer).—Local selected seed, sown 4th July; germination good; growth fair, but rather uneven; few spots of rust on the flag; some plants also diseased with the yellow leaf fungus; straw of fair quality, stands up well; height when mature, three feet nine inches; ripe 16th December; heads beardless,

three inches long, well filled; yield moderate, 18 bushels per acre; grain of fair size, yellow and plump. Fair variety, after the style of the purple straw.

WHEAT, FIFE ESSEX (Farrer, N.S.W.).—Local selected seed, sown 4th July; germination very even and fine; growth healthy; straw fine and tough quality, very clean, bright yellow, and free from rust or disease, stands up well; height when mature, four feet nine inches; ripe 22nd December; heads beardless, rather pointed, four inches long, well filled; yield at the rate of 25 bushels per acre; grain small and white, of excellent milling quality. This is one of the very best all-round wheats for the coastal districts for hay or grain; would be too late for the early districts.

WHEAT, AUSTRALIAN TALAVERA.—Local selected seed, sown 5th July; germination good; growth free and healthy; straw of good quality, stands up well, useful sort for hay; height when mature, four feet; ripe 16th December; heads beardless, three and a half inches long, nice form, well filled; yield good, at the rate of 22 bushels per acre; grain pale yellow, plump and fine, good milling quality. This is a vigorous, healthy grower, suitable for hay or grain in this locality.

WHEAT, RERRAF (Farrer, N.S.W.).—Local selected seed, sown 5th July; germination good; growth rapid; very clean, and healthy; colour blue green; straw slim, rather weak, and liable to lodge when fully headed; height, three feet nine inches; ripe first week in December; heads beardless, small, about three inches in length; grain white, small, and plump, of good milling quality; yield fair, at the rate of 16 bushels per acre. This is a very distinct variety of early wheat, clean and free from disease; should be useful for the drier districts.

WHEAT, FEDERATION (Farrer, N.S.W.).—New seed received from Mr. Farrer, sown 5th July; germination fine; growth strong and healthy; straw somewhat thick and coarse, and slightly spotted with rust on the flag, stands up very well; height when mature, three feet nine inches; ripe second week in December; heads beardless, of good size and shape, well filled; brown chaff; grain pale yellow and plump, of good milling quality; yield very good, at the rate of 25 bushels per acre. This is very promising early wheat.

WHEAT, PLOVER (Farrer, N.S.W.).—Seed received from Mr. Farrer, Tharwa, N.S.W., sown 5th July; germination rather thin and uneven; growth healthy and vigorous; straw of fair quality, stands up well; height when mature, four feet three inches; ripe second week in December; heads of fair size, beardless; grain plump, pale yellow, good quality; yield at the rate of 16 bushels per acre. This appears to be a fairly good new wheat, worthy of further trial.

WHEAT, RYMER (Farrer).—Seed received from Mr. Farrer, New South Wales, sown 5th July; germination even and fine;

growth vigorous; slightly rusty on the flag; straw of fair quality, stands up well; height when mature, four feet; ripe second week in December; heads beardless, good size, and well filled; grain white and plump; yield good, at the rate of 18 bushels per acre. New wheat of considerable merit.

WHEAT, FULL-HEAD (Farrer).—Seed received from Mr. Farrer, New South Wales, sown 5th July; germination even and good; growth tall, vigorous, and very healthy; straw nice and clean, good quality, stands up well; plants stool out well; should be a good sort for hay; height, five feet, level and neat; ripe late, 27th December; heads beardless, large, long, and well filled; grain amber colour, small, of good quality; yield very good, at the rate of 25 bushels per acre. Promising new wheat for culture in the coastal and cool districts.

WHEAT, TWEED (Farrer, N.S.W.).—Seed received from Mr. Farrer, sown 5th July; germination even and nice; growth uneven, some plants badly diseased with the yellow leaf fungus; straw of fair quality, stands up well; height, four feet; ripe last week in December; heads beardless, medium size; grain not large, but plump and good; yield at the rate of 16 bushels per acre.

WHEAT, DYNOON (Farrer, N.S.W.).—Seed received from Mr. Farrer, sown 5th July; germination good; growth vigorous, except some patches badly diseased with the yellow leaf fungus: straw good, stands up well; height four feet; ripe 27th December; heads beardless, large and of good form, well filled; grain medium size, white, good quality; yield at the rate of 16 bushels per acre. New late variety worthy of further trial.

WHEAT, LUCKY TALAVERA (Farrer, N.S.W.).—Seed received from Mr. Farrer, sown 5th July; germination good and even; growth healthy and vigorous; straw of fair quality, stands up well; height when mature, four feet six inches; ripe 20th December; heads beardless, large, and well filled; grain pale red, good quality; yield at the rate of 20 bushels per acre. Promising new variety for hay or grain; suitable for coastal districts.

WHEAT, 40C (Farrer, N.S.W.).—Seed received from Mr. Farrer, sown 5th July; germination even and fine; growth not tall or rank but healthy and good; straw of good quality, stands up fairly well; height when mature, three feet six inches; ripe first week in December; heads beardless, of fair size, holds grain well; grain white, small, and plump; yield fair, at the rate of 18 bushels per acre. Distinct new dwarf variety, which may prove to be very useful for culture in the early districts.

WHEAT, FIELD MARSHALL (Farrer).—Seed received from Mr. Farrer, New South Wales, sown 5th July; germination, thin and uneven; growth, healthy and fine; straw of good quality, stands up well; height, four feet; ripe 15th December; heads beardless, of good form and size, well filled; grain amber colour, good milling quality; yield at the rate of 16 bushels per acre.

Wheat, Brodie's Prolific.—Seed received from Mr. Farrer, New South Wales, sown 5th July; germination even; growth, healthy and vigorous; straw of good quality; stands up well; height when mature, four feet; ripe 18th December; heads beardless, three and a half to four inches long, neat shape and well filled; chaff, pale brown, holds grain very well, rather hard and tough to thresh; grain, medium size, pale yellow, and plump; good milling quality; yield good, 22 bushels per acre. Prolific mid-season wheat.

Wheat, Doon (Farrer).—Seed received from Mr. Farrer, N.S.W., sown 5th July; germination fine; growth free and healthy; straw fine, but of fair quality, somewhat liable to fall about and lodge, clean, and free from disease; height four feet; ripe second week in December; heads beardless, of fair size and good shape; grain white, plump, and fine, yield at the rate of 16 bushels per acre. Fair new variety.

Wheat, 1/J (Farrer).—Seed received from Mr. Farrer, N.S.W., sown 5th July; germination fair, rather thin; growth moderately vigorous, few plants attacked by the yellow leaf fungus; straw of good quality, stands up well; height when matured, three feet six inches; ripe first week in December; heads beardless, of good shape and size; grain pale yellow, nice and plump; yield at the rate of 16 bushels per acre. Promising new wheat for early districts.

Wheat, x/65/f (Farrer, N.S.W.)—Seed received from Mr. Farrer, sown 5th July; germination good; growth fair, slightly rusty on the flag; straw fairly good, stands up well; height four feet; ripe second week in December; heads beardless, of good size and form; grain yellow and plump; yield rather light, at the rate of 14 bushels per acre. This new wheat is not quite fixed in type yet.

Wheat, 21a Hangshan a. (Farrer).—Seed received from Mr. Farrer, N.S.W., 5th July; germination good; growth slow and upright, healthy, and free from disease; straw stands up well; height when mature, three feet six inches; ripe second week in December; heads beardless, thin, and small, not very productive, and very hard to thresh; grain white and small; yield very poor, at the rate of 12 bushels per acre. Does not appear to be suitable for culture here.

Wheat, x/62/F (Farrer).—Seed received from Mr. Farrer, New South Wales, sown 5th July; germination even and fine; growth vigorous and healthy; straw of good quality, stands up well, level and neat; height when mature, four feet; ripe second week in December; heads beardless, large and well filled; grain plump, good quality; yield good, rate of 18 bushels per acre. Promising new variety.

Wheat, 167 Vermont X Jubilee (Crossbred).—Local selected seed, sown 5th July; germination even and fine; growth healthy; straw rather slim and weak, falls over badly during windy weather, height, four feet, level; ripe second week in December; heads beard-

less, of good size and well filled; grain white, long, distinct form, good quality, nice showy grain; yield good, at the rate of 20 bushels per acre. This variety would I think be suitable for culture in the early districts.

Wheat, Queen's Jubilee (Victorian variety).—Local selected seed, sown 5th July; germination even and good; growth healthy and fine; straw of fair quality, stands up well; height when mature, four feet, level and neat; ripe second week in December; heads beardless, of good shape and size, well filled, holds grain well; grain white, large and plump, good quality; yield good, at the rate of 18 bushels per acre. Good second early wheat.

Wheat, Medick (Farrer, N.S.W.).—Local selected seed, sown 4th July; germination good; growth fair, badly diseased in parts by the yellow leaf fungus; straw large and coarse, stands up fairly well; height when mature, four feet; ripe third week in December; heads beardless, of good size and shape, well filled; grain pale yellow, and plump; yield at the rate of 20 bushels per acre. This variety did not do very well on these low moist plots.

Wheat, Tresor (Vilmorin).—French seed, sown 4th July; germination even and good; growth slow but healthy; straw fair quality, stands up well, slightly rusty on the flag, level; height when mature, four feet; ripe very late, 3rd January; heads beardless, of fair size, well filled, shells the grain easily; grain medium size, deep reddish yellow in colour, said to be of good milling quality; yield at the rate of 25 bushels per acre. This wheat gave the best results on the lowland.

Wheat, 25a (Farrer).

Unwin's Golden Chaff—Seed received from Mr. Farrer, N.S.W., sown 5th July; germination good and even; growth slow but healthy; straw good, stands up well, slightly rusty on the flag; height, four feet; ripe late, 3rd January; heads beardless, of fair size, well filled, brown chaff, shells the grain easily; yield poor, at the rate of 14 bushels per acre; grain amber colour. Very late variety and not productive; not desirable.

Wheat, No. 77 (Crossbred).—Local selected seed, sown 8th July; germination good; growth healthy, even and upright; straw rather weak and liable to lodge, free from disease; height when mature, four feet, level and fine; ripe 12th December; heads beardless and well filled; grain white, long, of distinct form, and good quality; yield at the rate of 18 bushels per acre. Fair second early variety.

Note: Plots C.—These are lowland, old cultivation, similar to the last; previous crops, barley and oats; manure used at the rate of 2cwt. per acre, applied in the drill the same as on plot A. The following varieties of wheat are mostly strong flour kinds introduced from America. They are of slow growth, and better adapted for culture in cold climates; they require a long season to mature in. They were received and sown too late to give them a fair chance this season.

WHEAT, No. 181.—Seed received from Experimental Station, Minnesota, America, sown 10th July; germination fairly even; growth healthy, but very slow; straw fine, of good quality, stands up very well, clean and free from disease; height when mature, three feet six inches to three feet nine inches; ripe late first week in January; heads beardless, small; grain pale red, of fair size; yield at the rate of 14 bushels per acre; of superior milling quality, but not very productive here.

WHEAT, 149 (Minnesota Station, America).—Seed sown 10th July; germination fairly even; growth very slow, free from disease; straw slim and clean, stands up well; height when mature, three feet six inches; ripe first week in January; heads beardless, medium size; grain pale red, small; yield poor, at the rate of 12 bushels per acre. Late, and not prolific.

WHEAT, BLUESTEM (American variety).—Local selected seed, sown 25th July; germination fairly even; growth healthy; straw fine, very good and clean; height when mature, three feet six inches; ripe first week in January; heads beardless, thin, long, and fairly filled; brown chaff, holds grain well; grain white, medium, and plump, of good quality; yield poor, at the rate of 12 bushels per acre. This appears to be a good strong flour variety that will give better results when sown early in the autumn.

WHEAT, MANITOBA (strong flour variety).—Local selected seed, sown 25th July; germination slow; growth healthy and fairly even; straw fine, of good quality, stands up well, clean, and free from disease; height when mature, three feet six inches; ripe first week in January; heads beardless, medium size; grain small, pale red in colour; yield poor, at the rate of 12 bushels per acre. Late variety.

WHEAT, No. 66 (Minnesota Station, America.)—Sown 25th July; germination slow, weak, and uneven; growth poor and patchy; straw fine, clean, free from disease, stands up fairly well; height when mature, two feet six inches to three feet. Ripe 1st January; heads beardless, thin and small; grain pale red, of medium size; yield light, at the rate of 10 bushels per acre.

WHEAT, No. 169 (Minnesota Station, America.)—Strong flour variety, sown 25th July; germination strong and even; growth good; nice clean straw, which stands up well, healthy and free from diseases; height when mature, three feet nine inches; ripe first week in January; heads beardless, of fair size, and well filled; velvety chaff, shells the grain easily; grain deep red, medium size, plump, of good quality; yield fair, at the rate of 15 bushels per acre. This seems to be one of the best in this class.

WHEAT, No. 163 (Minnesota Station, America).—Sown 25th July; germination slow and weak; growth poor and very uneven, clean and free from disease; straw of good quality, stands up well; height when mature, three feet to three feet six inches; ripe first week in January; heads beardless, small and thin; grain red and

plump; yield poor, at the rate of 12 bushels per acre; sample mixed. This plot rather low and wet.

WHEAT, BLUESTEIN (strong flour variety).—Seed received from Bathurst Experimental Farm, N.S.W.), sown 26th July; germination fair and even; growth very slow and poor; straw slim, clean, and of fair quality; height, two feet six inches to three feet; ripe 4th January; heads beardless, small and thin; grain small, red, but not very productive; yield very poor, at the rate of 10 bushels per acre. Sown too late for satisfactory results here.

WHEAT, POWER'S FIFE (strong flour variety).—Seed received from Bathurst Experimental Farm, New South Wales; sown 26th July; germination fairly even; growth slow and uneven; nice clean straw, which stands up well; height when mature, two feet six inches to three feet six inches; ripe 3rd January; heads beardless, medium size; velvety chaff; shells grain easily; very similar to No. 169 Minnesota; grain red, good quality; yield poor, at the rate of 12 bushels per acre.

WHEAT, 146 (strong flour variety).—Seed received from Minnesota Experimental Station, America, sown 25th July; germination good and even; growth slow, but healthy and even; straw slim, clean, and of good quality, stands up well; height, three feet six inches; ripe 3rd January; heads beardless, of fair size, and well filled; grain red, medium size, and plump; yield good, at the rate of 15 bushels per acre. Good late variety.

NOTE: LOWLAND, PLOTS D.—Soil similar to the last; but the land was twice ploughed, and fertilisers applied in the drills at the rate of 2½cwt. per acre. The varieties, very choice, new, and unnamed crossbred, received from Messrs. Garton Brothers, Warrington, England, sown in drills, 10 inches apart. The oats made really remarkable growth, and gave first-class returns of large, plump grain of excellent feeding quality. The straw was too coarse and rank for good hay. The barley did not give very high returns; it never does very well on this class of soil.

BARLEY, GARTON'S A.—English seed, plump and fine, sown 28th August; germination even and strong; growth, rather uneven, but healthy; straw fairly good, stands up well; height when mature, three feet six inches ripe, 25th December; good heads, well filled; yield rather light, at the rate of 11½ bushels per acre; good malting quality; grain heavy and good. Promising new variety for suitable soils.

BARLEY, GARTON'S B.—English seed, plump and good, sown 30th August; germination good; growth rather uneven and weak; straw of fair quality, stands up well; height two feet nine inches; ripe 28th December; heads of fair size and well filled; grain large and nice, of good quality; yield at the rate of 12¼ bushels per acre. Promising new variety for suitable soils.

OATS, GARTON'S A.—English seed, plump and heavy, sown 29th August; germination even and good; growth very vigorous;

straw large and coarse, not very suitable for hay; heads level and even; height when mature, five feet, level and neat; ripe 4th January; heads large and spreading, well filled, with heavy grain, which is of medium length and white in colour; yield very good, at the rate of 34 bushels per acre. Good variety for feeding grain.

OATS, GARTON'S B.—English seed, sown 30th August; germination good; growth even and very strong, healthy; straw large, somewhat coarse for hay, stands up fairly well; height when mature, six feet, level and neat; ripe 6th January; heads large, spreading, and well filled; grain of good feeding quality, pale yellow; yield excellent, at the rate of 61½ bushels per acre. This is one of the very best oats tested here.

OATS, GARTON'S C.—English seed, sown 2nd September: germination even and good; growth vigorous and healthy; straw rather coarse, does not stand up well, liable to become badly laid when nearly ripe; height five feet six inches; ripe 6th January; heads of fair size, spreading, and well filled; yield good, at the rate of 48 bushels per acre. Fair variety for grain; straw rather coarse for hay.

OATS, GARTON'S D.—English seed, sown 31st August; germination strong and even; growth robust and level; straw large, stands up well, healthy. This variety has a bad fault: many of the heads break off at the top joint when nearly ripe, during windy weather. Height when mature, five feet six inches; ripe 4th January; heads large and compact, grain on side; yield very good, at the rate of 51 bushels per acre; good for feeding grain; straw somewhat coarse for hay. No doubt on lighter soils the straw would be good for hay. This applies to all the above varieties, which, in habit of growth are very like the New Zealand oats.

WEST AUSTRALIAN VINE-GROWERS' ASSOCIATION.

A meeting of the recently formed West Australian Vine-growers' Association was held at the office of the Department of Agriculture on 7th November, for the purpose of electing officers and the adoption of by-laws. Among those present were Mr. R. D. Hardey, "The Peninsula," in the chair; Mr. C. W. Ferguson, "Houghton"; Mr. A. Despeissis; Mr. W. M. Gordon, "Derry-nasura"; Mr. A. C. Pole, "Eumalga"; Mr. Logue, jun., "Fair-lawn"; and Mr. R. L. Cook, secretary, *pro. tem.*

It was decided to defer the appointment of council and officers until the next meeting to be held December 17th. The by-laws, which are similar to those of the South Australian Vine-growers'

Association, were considered and adopted. It was decided: "That any person who shall have an interest in the vine industry of West Australia, and whose name shall be approved by the Council, shall, on payment of his subscription (10s. per annum), be entitled to become a member."

The object of the association is to create a means whereby united action may be taken with reference to any matter affecting the vine-growing industry of Western Australia by those interested, and also for the interchange by members of knowledge and experience in practical viticultural topics, such as culture, pruning, fertilising, fermenting, distilling, rectifying, raisin-drying, and treatment of diseases of the vine, as the requirements of each district may show to be necessary or important, and generally to advance the welfare of the industry and those connected with it.

With the advance of the vine-growing industry the need of such an association as that just formed has been felt, and the promoters of the association have received promises of support from many leading growers. If those directly interested in the vine-growing industry in this State will loyally support this institution by becoming members and electing progressive and energetic men to the council, there is no doubt this association can be made a real power for the advance of the wine industry. While it is universally admitted by those competent to judge that the soil and climate of Western Australia are particularly suited for the growth of the vine and the production of wines of excellent quality, it is unfortunately true that, notwithstanding the assistance of a protective tariff against outside competition, the wine producers as a class have not made the money that those engaged in other branches of agriculture have. The interchange of ideas among the members of the new association should lead to more systematic and scientific practices being adopted by the main body of wine-makers, and thus tend to the production of a more uniform class of wine, which would undoubtedly have a beneficial influence on the industry.

In devising some practical scheme whereby the small growers may obtain a ready return for their crop of grapes or new wine without flooding the market with an immature and inferior wine, there is an opening for the Association to confer an immense benefit not only on the small grower and the industry generally but also upon the consumer, who would not be slow to realise the advantage of being always able to obtain local wines of an even and acceptable quality. Mr. R. L. Cook, King Street, Perth, is the secretary *pro tem.*, from whom all particulars relating to the Association may be obtained on application.

INSPECTOR'S REPORT.

By A. VAUGHAN.

Having made an inspection of the Wellington District, I report as follows:—

SAN JOSE SCALE was found in 20 orchards, more or less infested, and I am pleased to be able to report that all the trees have been treated, fumigation being resorted to in all cases where tents were available, and on small trees slightly infested spraying and painting with strong mixtures has been found to be successful. I may say on the whole the growers have given me every assistance, and have made up their minds, if it is possible, to eradicate this scale; and after inspecting the orchards where the fumigation has been carefully carried out, and where the whole orchard has been fumigated, or where a large proportion of trees have been treated round the infested area, it certainly looks as if they will be successful. Growers in this district recognise the damage this scale will do, and are not satisfied with any half measures. This has been of great help to me, as it has enabled us to work together, which has resulted in mutual benefit. No good will be done unless inspector and growers work together.

To my mind the chief points in eradicating this scale are as follows:—Every grower should try and make himself acquainted with the appearance of this scale, and should make a point of visiting any orchard in which the scale exists. Do not wait for an inspector to come round and find it for you. If he comes round and finds it once on certain trees, and marks those trees he finds it on, do not be satisfied that he has found all the scale in the orchard, for that is impossible. After you have treated those trees marked or pointed out, keep a constant look-out, and treat at once if you find any more, according to the season. Only constant watchfulness, with careful and constant treatment, will eradicate disease. The work of fumigation could have been carried out more expeditiously if more tents had been available and if it had been easier to procure sulphuric acid. A lot of time was lost by the acid only being able to be sent once a week, and I would suggest that one or two tents and some chemicals be left with the secretaries of the local societies in those districts where most scale has been found. Great credit is due to Messrs. Martin, Whistler Bros., and Scarlett, on the Preston, and Clifton Bros., Waterloo. These growers have fumigated the whole of their orchards, or the section of trees where scale was found. This must be the cheapest way in the long run, if the scale has got a hold of the orchard at all. It is not sufficient only to treat those trees on which it has been found.

RED SCALE.—Next to the *San Jose*, this is the worst scale that has to be dealt with in this district, especially on the citrus trees;

and there is no doubt the small growers are not successful with their treatment, especially those that have old trees. It may be they do not mix their sprays properly and do not thin the trees out enough, or have not a powerful enough spray-pump. This scale is mostly confined to the old trees, the younger orchard being clean, except those that have come in contact with diseased trees. On account of the stricter inspection and fumigation of nursery stock, I am of opinion, with a proper outfit in the hands of competent men, this scale could be eradicated at a very small cost.

Black Scale *(Lecanium Oleæ)*, Soft Scale *(Lecanium Hesperidum)*, Greedy Scale *(Aspidiotus rapax)*.—These are the other three scales found in this district, and have got too great a hold to be able to be eradicated with spraying. All are more or less parasitised now, but not sufficiently. No doubt with those parasites introduced by Mr. Compere, these scale will be kept down to such an extent as to be of no danger.

Red Mite is the most prevalent insect in these parts, and breeds with such rapidity that it is a serious pest. From observation it seems to me this pest has been brought into the younger orchards from the other States even in recent years, fumigation having no effect on the eggs; the old isolated orchards are mostly clean. A parasite that would keep this mite in check would be most useful, as it will never be eradicated by spraying.

Woolly Aphis is gradually getting less, but is causing some growers trouble; a more united effort, and the gradual destruction of trees not grafted on to blight-proof stock, will assist in its eradication.

Black Peach Aphis is not very prevalent, but still where it has got a hold is causing growers trouble. I believe some parasite must be in this State already, as some growers have told me, and I have seen where it has disappeared without any spraying, but have not yet been able to find the beneficial insect.

These are the worst insect pests in these districts, and there is no reason why they should not be kept down, so as to be of no danger, and no fresh ones brought in, as long as proper precautions are taken.

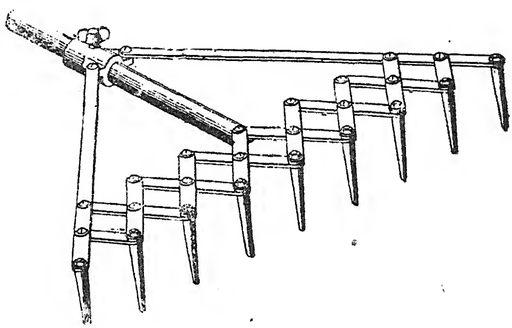
Fungoid diseases in this district may be always more or less troublesome, but up to the present have not done a great deal of damage. By judicious spraying, and planting varieties that are not liable to disease, a great deal of loss may be avoided. The same may be said of some old pear trees which exist in this district, attacked with *fusicaladum pyrium*, as has been said of old citrus trees infested with scale: growers have sprayed with no result. From the latest experiments it appears the right time to spray is when the leaves and fruit are young. The reason for this seems to be that the spores, or seeds, must have a proper seed bed to germinate, and the young leaf and fruit are in exactly the same condi-

tion. As the leaf grows the skin gets thicker, and is not so suited for the germination of the spores, therefore it is most necessary to spray when the leaves are young. It must be borne in mind the actual damage is very often not noticed until the damage is done—until the fungus has completed its life circle: germinated, grown, fruited, and seeded; therefore it is no good waiting until you actually see the disease before you spray, as this is too late. Prevention is better than cure applies very much to fungoid diseases.

As this district is so far free from the Mediterranean fruit fly, the growers naturally ask that all reasonable precautions may be taken to keep it so. Besides the ordinary dangers, places like Bunbury, Collie, and Greenbushes, that may get fruit from infested districts, are a source of danger, and I would suggest that a copy of the Act be sent to the fruiterers in these towns, and that some system for the inspection of the fruit in these shops be arranged.

AN ADJUSTABLE AND FOLDABLE RAKE.

It can hardly be denied that the ordinary rake takes up an inconvenient amount of room in a barn. A Kentuckian has sought to overcome this inconvenience in a most ingenious way, and which is illustrated in the *Scientific American*. He mounts the teeth of his rake on links pivoted together after the manner of lazytongs,



and connects the lazytongs thus formed with a collar sliding on the handle of the rake. By shifting this collar along the handle it is possible to adjust the width of the rake, and to bring the tines so close together that little or no room will be taken up when the rake is not in use.

AGRICULTURAL SHOWS.

The following shows have taken place since our last issue, reports of which are given as appeared in the Press:—

NORTHAM AGRICULTURAL SHOW.

The annual show held by the Northam Agricultural Society took place on the 14th and 15th of October, under favourable conditions. The weather, though cloudy, was fine and cool. A considerable number of visitors attended each day, and in this respect the experience was up to expectation. It is gratifying to be able to record that the show was a pronounced success, and visitors were enabled to see one of the finest collection of stock and agricultural machinery that has ever been got together in Western Australia. On all hands one heard the admission that the show transcended any previously held in the district, and there were not wanting many to contend that even the National Show has not produced a better display. The people of Northam are to be congratulated on the high pitch of excellence to which their annual show has been brought, and if it is as capably managed in the future as it was on this occasion, the annual function of the local Agricultural Society bids fair to take a leading place in the State.

The following is the prize list:—

THE PRIZE LIST.

Blood Horses.

Entire (open class): W. J. Leeder's "Tremando," 1; Mrs. M. Dempster, 2. Mare, visibly in foal or foal at foot: Mrs. M. Dempster's "Ella," 1; W. R. Tink's "Fancy," 2. Mare: C. E. Dempster's "Primrose," 1. Roadster entire: Mrs. M. Dempster's "Commonwealth," 1. Roadster mare: H. Hummerston's "Pretoria," 1. Yearling filly: H. F. Throssell's "San Toy."

Draught Horses.

Entire: Mrs. M. Dempster's "Young Sir Simon," 1; H. F. Throssell's "Non Such," 2; H. Teesdale Smith's "Lord Cardinal," 3. Mare: H. F. Throssell's "Gipsy," 1; T. H. Wilding's "Gyp," 2. Mare, visibly in foal or foal at foot: H. F. Throssell's "Gipsy," 1; T. H. Wilding's "Gyp," 2. Four-horse team: H. F. Throssell, 1; W. P. Dempster, 2. Two-horse team: W. P. Dempster. Pair farm geldings: A. G. Loton. Pair farm mares: J. H. Wilding. W.A. bred entire: Lennon Bros.' "Pride of the Valley," 1; J. H. Wilding's "Prince Alfred," 2. Mare, visibly in foal or foal at foot: A. G. Loton's "Judy," 1; R. and W. Burges's "Minnie," 2. Mare: J. H. Wilding's "Magnet," 1. Yearling colt: Mrs. M. Dempster's "Buckland," 1. Yearling filly: Mrs. M. Dempster's "Tomy Violet." Two-year-old colt: T. H. Wilding's "Prince Alfred," 1; R. and W. Burges, 2. Two-year-old filly: J. H. Wilding's "Dinah," 1. Lorry horse: J. and W. Holland's "Baldy." Best three-year-old cart filly: Mrs. M. Dempster's "Miss Madge," 1; Andrew Martin's "Rose," 2. Two-year-old gelding, by "Non Such": H. F. Throssell's "Prince Lion." Two-year-old filly, by "Non Such": J. H. Wilding's "Dinah." Two-year-old colt, by "Non Such": J. H. Wilding's "Prince Alfred."

Hacks.

Maiden hunter: H. F. Throssell's "Horace," 1; W. Jamieson's "Botley," 2. Best trotter: H. Hummerston's "Pretoria," 1; R. Hummerston's "Romano," 2. Single buggy pony (14·2 and under): R. Hummerston's "Dolly," 1; H. Withnell's "Rudyard Kipling," 2.

Horned Cattle.

Jersey or Alderney bull: H. F. Throssell's "Red Riband," 1; F. R. Walsh's "Eltoro," 2. Jersey or Alderney cow: G. L. Throssell's "Jenny Lind," 1; F. R. Walsh's "Dairymaid," 2. Ayrshire bull: Mrs. M. Dempster, 1; Messrs. R. and G. Burges's "Bully," 2. Ayrshire cow: Mrs. M. Dempster's "Lady Maid," 1; Mrs. M. Dempster's "Lady Alice," 2. Ayrshire heifer: R. and G. Burges's "Pet," 1. Jersey or Alderney heifer: H. F. Throssell's "Daisy Bell." Cow for beef: A. W. Edgar's "Princess," 1. Jersey heifer (special prize): H. F. Throssell's "Daisy Bell." Pen of two fat cows or heifers (bred South of the Murchison): T. H. Wilding, 1; Mrs. M. Dempster, 2. Jersey bull (under two years): H. F. Throssell's "Three Cheers." Shorthorn bull: A. W. Edgar's "Lindenow Duke of Derrimut the Second," 1; A. G. Loton's "Gladiator," 2. Shorthorn cow: A. G. Loton's "Annie," 1; A. W. Edgar's "Miss Matilda the Eighteenth," 2. Shorthorn heifer: A. W. Edgar's "Strathalbyn Gift." Fat beast (W.A. bred): T. H. Wilding, 1 and 2.

Sheep (Open Class).

Merino ram: Darlington and McDonald, 1; A. G. Loton's "Tasmania," 2. Merino ewe: Henry Wills and Co., 1; A. G. Loton, 2. Lincoln ram: Marwick Bros., 1; Mrs. M. Dempster, 2. Lincoln ewe: Darlington and McDonald, 1; Marwick Bros., 2. Shropshire ram: A. W. Edgar's "Nonpareil," 1; H. W. Hancock, 2. Shropshire ewe: A. W. Edgar, 1; H. Wills and Co., 2. Pen of five fat wethers: T. H. Wilding, 1 and 2. Pen of five fat lambs: T. H. Wilding, 1; H. W. Hancock, 2.

W.A. bred Sheep.

Merino ram, fine wool: A. G. Loton, 1; T. H. Wilding, 2. Merino ram, one and a-half years or under: A. G. Loton, 1 and 2. Merino ewe, one and a-half years or under: A. G. Loton, 1; E. Keane, 2.

Pigs.

Berkshire boar: E. Keane, 1; F. Rewell, 2. Berkshire sow: F. Rewell, 1 and 2. Yorkshire sow: R. G. Meares, 1; Mrs. M. Dempster, 2. Boar other than Berkshire or Yorkshire: G. M. Richardson, 1; J. Lacey, 2. Sow other than Berkshire or Yorkshire: T. H. Wilding. Boar, six months old or under: Mrs. M. Dempster, 1; T. H. Wilding, 2.

Best horse over hurdles: L. Clarkson's "Lang Syne." Tradesman's turn-out: J. Rodgers. Pair of carriage horses, over 15·2: Mrs. M. Dempster. Boy's pony, 14·2 and under: A. Martin's "Fatima." Pair of buggy horses, 15.2 and under: R. Hummerston. Girl's pony, 14·2 and under: H. Withnell's "Rudyard Kipling". Gentleman's hack, 10st.: L. Clarkson's "Lang Syne." Best lady's turnout, horse, rider, and outfit: Mrs. M. Dempster, T. H. Wilding, and H. Whincock divided for first place. Weight-carrying hack: J. Mitchell's "Jack," 1; W. H. Dunstan's "Troubadour," 2. Single buggy horse, over 15·2: W. J. Stewart's "Buller." Pair of hacks, ridden by lady and gentleman: J. Mitchell's "Jack" and "White Wings." Hunter, to carry 12st.: L. Clarkson's "Lang Syne," 1; H. T. Smith, 2. High Jump: H. Withnell's "Joker." Harness pony, 13·2 and under: R. Hummerston's "Dolly." Gentleman's hack, 11st.: J. Mitchell's "White Wings." Hunter, to be judged also for condition of horse, outfit, and rider: W. H. Dunstan's "Troubadour," 1; L. Clarkson's "Lang Syne," 2. Tug of war on horseback: Loco. team.

KELMSCOTT AND ARMADALE AGRICULTURAL SOCIETY.

Annual Show.

The annual show of the Kelmscott and Armadale Agricultural Society was held on 16th October at Kelmscott, in delightful weather. There was a large attendance, and a number of the legislators accepted the invitation of the society to be present. Considerable improvements have been effected on the ground since last year. The old cattle and pig pens have given place to new ones, which in every way are a distinct improvement on those which were formerly used. The entries were not as numerous as those received last year, but in many lines the quality of the exhibits showed a marked improvement. Horses were very poorly represented, but some fine cattle were shown by Messrs. Cockram & King, Jas. Butcher, G. F. Marsh, and R. Marsh. In pigs, all honours for Berkshires were carried off by J. Faulkner, with some splendid specimens of the breed. The show of fowls was a fairly good one, although, judging by the number of empty pens, the entries were not as numerous as the secretary had expected.

Appended is the prize list:—

Cattle.

Jersey bull: Cockram & King, 1; R. Marsh, 2. Jersey cow: Jas. Butcher, 1; R. Marsh, 2. Jersey heifer, two years and under: A. Butcher, 1; Cockram & King, 2. Heifer, any breed: G. F. Marsh, 1; L. Butcher, 2. Ayrshire cow: G. F. Marsh, 1; R. Marsh, 2. Crossbred dairy cow: G. F. Marsh, 1; A. V. Cross, 2. Best milch cow: R. Marsh, 1; G. F. Marsh, 2.

Pigs.

Berkshire boar, any age: Faulkner, 1 and 2. Berkshire sow, any age: Faulkner, 1 and 2. Yorkshire boar: Cullen, 1. Yorkshire sow: Cockram & King, 1; A. Butcher, 2. Porker, under six months: R. Batt, 1. Sucking pigs, under two months: J. Butcher, 1 and 2.

Flowers.

Twelve varieties of roses: W. Buckingham, 1; H. D. Cullen, 2. Six roses: W. Buckingham, 1; H. D. Cullen, 2. Three roses: Mrs. J. Butcher, 1; W. Buckingham, 2. Champion rose: W. Buckingham, 1; Mrs. J. Butcher, 2. Bunch of garden flowers: Miss Ada Cockram, 1; Mrs. W. Saw, 2. Bunch of wild flowers: Mrs. A. Ward, 1; W. Buckingham, 2. Gents' buttonholes (garden): Miss Ada Cockram, 1; R. Batt, 2. Gents' buttonholes (wild): Miss Ada Cockram, 1; Mrs. W. Saw. 2. Hand bouquet (garden): Miss Ada Cockram, 1; Mrs. W. Saw, 2. Hand bouquet (wild): Miss Ada Cockram, 1. Bunch of everlastings; Miss Ada Cockram, 1; R. Butt, 2. Bunch of carnations: Mrs. W. Butcher, 1; Mrs. W. Saw, 2. Bunch of violets: Miss A. Cockram, 1; R. Batt, 2. Wreath of wild flowers: Miss M. Salter, 1. Lady's spray (garden): Miss A. Cockram, 1; R. Batt, 2. Lady's spray (wild): R. Batt, 1 and 2. Wreath of garden flowers: Mrs. W. Butcher, 1. Collection of kangaroo paws: W. Buckingham, 1; Miss Ada Cockram, 2. Collection of orchids: Miss Ada Cockram, 1; Mrs. E. Salter, 2 Collection of pansies: R. Batt, 1 and 2. Collection of everlastings (variety): Miss M. Butcher, 1; R. Batt, 2.

Vegetables.

Broad beans: W. San, 1; H. G. Butcher, 2. Beetroot: R. Batt, 1. Cauliflowers (three heads): H. G. Butcher, 1. Cabbage (three heads): B V. Cross, 1. Cabbage (red): J. Butcher, 1; T. James, 2. Shorthorn carrot: J. Butcher, 1; A. Butcher, 2. Long carrot: J. Butcher, 1; T. James, 2. Lettuces: A. Butcher, 1. Lettuces (cabbage): B. V. Cross, 1; A. Butcher, 2. Collection of vegetables: A. Butcher, 1; B. V. Cross, 2. French beans: A. Butcher, 1. Onions: A. Butcher, 1; T. James, 2. Potatoes: J. Butcher, 1; A. Butcher, 2. Potatoes (two varieties): J. Butcher, 1; H. J. Butcher, 2. Potatoes (three varieties): J. Butcher, 1. Peas: H. J. Butcher, 1; A. Butcher, 2. Parsnips: J. Butcher, 1; B. V. Cross, 2. Radishes: B. V. Cross, 1; A. Butcher, 2. Eschalots: H. Gibbs, 1; R. Batt, 2. Turnips (two varieties): B. V. Cross, 1. Collection of salads: A. Butcher, 1; B. V. Cross, 2. Bugle pumpkins: E. Cockran, 1; B. V. Cross, 2. Pumpkins (any other variety): B. V. Cross, 1. Swedes: E. Salter, 1; A. Butcher, 2. Mangold: J. Butcher, 1 and 2. Collection of root crops: A. Butcher, 1; B. V. Cross, 2. Rhubarb: J. James, 1.

Fruit.

Collection of fruit (special): A. V. Cross, 1. Citrous fruit: A. V. Cross, 1. Strawberries: A. V. Cross, 1; R. Batt, 2. Dozen eating apples: J. Butcher, 1. Cape gooseberries: J. Butcher, 1; W. Buckingham, 2. Dozen lemons: G. and A. Watts. 1; J. Butcher, 2. Loquats: W. San, 1. Mardarins: A. V. Cross, 1. Oranges (Navel): A. E. Kimber, 1 and 2. Oranges (other than Navel): A. Kimber, 1; W. Whittington, 2. Passion fruit: W. Butcher, 1; J. Ward, 2. Pomoloes: A. V. Cross, 1 and 2. 1lb. of strawberries: R. Batt, 1: A. Kimber, 2. 1lb. of strawberries (wild): Miss Ada Cockram, 1.

Fowls.

Pekin ducks: Mrs. H. J. Easy, 1; Mrs. E. Salter, 2. Houdan cock: T. Martin, 1 and 2. Minorca hen: Mrs. H. J. Easy, 1 and 2. Minorca cock or cockerel: Mrs. H. J. Easy, 1; Mr. Cullen, 2. Langshan cock or cockerel: A. V. Cross, 1. Brown Leghorn hen: Mrs. H. J. Easy, 1; Mrs. J. Butcher, 2. Game hen: Mr. Winning, 1; Mr. Armstrong, 2. Game cock or cockerel: Mr. Winning, 1; Mr. Armstrong, 2. Wyandottes (silver cock or cockerel): A. V. Cross, 1. Crossbred hens: Mrs. J. Butcher, 1; A. V. Cross, 2. Andalusian cock: Thomas Martin, 1 and 2. Andalusian hen: Thomas Martin, 1; A. V. Cross, 2. Houdan hen: Thomas Martin, 1; Mrs. J. Butcher, 2. Aylesbury ducks: Mrs. H. J. Easy, 1. Indian runner ducks: B. Butler, 1; R. Batt, 2.

Horses.

Lady's hack (to be ridden): Thomas, 1; Cockram and King, 2. Gentleman's hack (to be ridden): Thomas, 1; March, 2. Hunter: Thomas, 1; Dellar, 2; W. P. Read, 3. Pair draught horses: Dellar, 1. Sulky turnout (open): Thomas, 1. Sulky turnout (members only): Atherton, 1; Cockram and King, 2. Farmer's springcart turnout: B. V. Cross, 1. Pony (14 hands and under): Windsor, 1; S. Gibbs, 2. High jump: J. Butcher, 1.

PINGELLY ANNUAL SHOW.

The annual show of the Pingelly Agricultural Society took place on the local grounds, on Thursday, the 16th October, and constitutes a record for attendance.

Following is the result of the judging:—

Horses.

Imported draught stallion: J. McBurney, 1 (one entry). Colonial-bred stallion: W. E. Robinson and Co.'s "Young Improver," 1 (one entry). Colonial-bred mare: F. H. Watts, 1 (three entries). Blood stallion: P. Taylor's "Motto," 1 (two entries). Lady's hack: H. Taylor, 1; W. Pollard, 2 (six entries). Buggy pair: J. McBurney, 1; S. H. Sewell, 2 (six entries). Single buggy horse: H. Taylor, 1; J. N. Taylor, 2 (five entries). Ponies: G. M. Sewell, 1; F. Overhen, 2 (nine entries). Jumping hack: J. Bacon, 1; W. Pollard, 2 (five entries). Plough team: G. Sewell, 1 (three entries).

Cattle.

Bull: G. Bostock, 1; G. Sewell, 2. Cow: G. and A. Fairhead, 1; S. Sewell, 2 (six entries).

Sheep.

Longwool ram: H. Taylor, 1; G. Sewell, 2 (five entries). Merino ram: Darlington and McDonald, 1 and 2 (five entries). Longwool ewes: Darlington and McDonald, 1; H. Taylor, 2 (three entries). Fat lambs: H. Taylor, 1 (one entry). Fat sheep: H. Taylor, 1 and 2. Shropshire ram: W. Robinson and Co. (one entry). Merino ewes: G. Sewell, 1 and 2 (three entries).

Pigs.

Berkshire Boar: W. Robinson and Co.

Poultry.

Langshans: J. Parkes. Leghorns: E. Watts, 1; J. Stone, 2. Minorcas—Rooster: E. Watts, 1; Fairhead Bros., 2. Hen: Mrs. J. N. Taylor, 1; Fairhead Bros., 2. Orphington—Rooster: Mrs. J. Taylor. Plymouth Rocks—Rooster: G. M. Sewell, 1; G. Holyoake, 2. Hen: G. Holyoake. Wyandottes: D. Sewell, 1; F. Curtis, 2. Table fowls: J. Parkes, 1 and 2. Turkeys: Mrs. G. Smith. Geese: Mrs. G. Smith. White ducks: Misses E. and O. Taylor, 1; J. Stone, 2. Brown ducks: Mrs. G. Smith.

Produce, etc.

Wheaten hay chaff: Fairhead Bros., 1; H. Taylor 2 (seven entries). Oaten hay chaff: Fairhead Bros., 1 (two entries). Wheat: D. Sewell, 1; J. Morrison, 2 (four entries). Oats: W. McLeod. Ham: Mrs. Williams, 1; G. Sewell, 2 (four entries). Bacon: G. Sewell, 1; Mrs. Williams, 2 (four entries). Brown potatoes: J. Sewell, 1 (two entries). Kidney potatoes: H. Taylor, 1 (two entries). Beetroot: J. Taylor, 1; E. Watts, 2. Swede turnips: F. Curtis, 1; Mrs. Stone, 2 (six entries). Yellow turnips: F.

Overhen, 1; J. Taylor, 2 (five entries). White turnips: W. Kerr, 1; F. Curtis, 2 (three entries). Carrots: J. Taylor, 1; Mrs. Stone, 2. Onions: J. Wansbrough, 1; J. B. Taylor, 2. Radishes: J. Taylor, 1; F. Curtis, 2. Cauliflower: E. Watts, 1; F. Curtis, 2 (seven entries). Lettuce: W. Kerr, 1; J. Wansbrough, 2 (eight entries). Pumpkins: J. Wansbrough. Peas: J. McBurney, 1; F. Curtis, 2 (six entries). Beans: G. Sewell. Collection of vegetables: J. Taylor, 1; Mrs. Stone, 2 (six entries). Bread: J. McBurney, 1; Mrs. W. Morrison, 2 (nine entries). Butter: J. McBurney, 1: Mrs. Stone, 2 (twelve entries). Jam, home-made: Mrs. Taylor. White shirt: Mrs. Claydon, 1; Miss Sewell, 2 (six entries). Needlework: Miss Grainger. Best kept exercise book: Reuben Shaddick. Map of Africa: Vivian Robinson, 1; Percy Reynolds, 2. Needlework, under 12: Hilda Shaddick, 1; Annie Lobban, 2. Exercise book, under 12: Reuben Atkins, 1; Eva Atkins, 2. Darning: J. Morrison, 1; Annie Lobban, 2. Dressed doll: Miss O. Taylor, 1; Miss E. Taylor 2. Scones: Miss A. Robinson, 1; Mrs. McBurney, 2. Jam, special: Miss Kerr, 1; Mrs. Sewell, 2. Cakes and pastry: Mrs. Clayden, 1; Mrs. McBurney, 2. Honey: Mrs. Clayden, 1; J. Wansbrough, 2. Dairy produce: Mrs. Taylor, 1; Mrs. Bostock, 2. Pinafore: Miss A. Robinson, 1; Miss Hilda Shaddick, 2. Window plants: Miss Sewell. Cut flowers: Mrs. Robinson, 1; Mrs. G. Sewell, 2.

NARROGIN-WILLIAMS AGRICULTURAL SOCIETY.

The annual show of the above society was held on the local grounds on Tuesday, 21st October. The weather was all that could be desired, though the attendance was not quite up to the standard of previous years.

Following is a list of the successful exhibitors:—

Horses.

Draught Stock.—Best stallion: W. Cornwall, 1. Stallion travelling the district: W. Cornwall, 1. Western Australian bred stallion: M. Brown, 1. Brood mare with foal: W. Graham, 1. Four horses in waggon: E. L. Smith, 1. Three-year-old colt: Messrs. Clayton and Rentoul, 1. Blood Stock.—Champion entire: E. A. Hamersley, 1. Pony hack: E. A. Hamersley, 1. Hunter: J. Bacon, 1. High jump: J. Bacon, 1. Several horses in this class were, through a technical error, disqualified.

Cattle.

Jersey bull, Jersey cow, Jersey bull (two years old), and Ayrshire cow: W. Cornwall, first prize for each. Jersey heifer, two years old: W. Graham, 1. Shorthorn cow: J. Mitchell, 1. Shorthorn bull: E. L. Smith, 1. Fat beast: J. Mitchell, 1. Best dairy cow, milked on ground: W. Down, 1.

Sheep.

Champion merino ram and merino ewe: W. Cornwall, first for each. Pen of three fat lambs, pen of three fat wethers, Lincoln ram and Lincoln ewe: J. N. Taylor, first for each. Shropshire ram: W. Graham, 1. Romney Marsh ram: E. Smith, 1. There was a good exhibition of sheep.

Pigs.

There were few entries. Tamworth sow and boar: W. Down, 1.

GRAIN.

Wheat: W. H. Ingram, 1. Algerian oats: R. T. Glasson, 1. Wheaten chaff: A. Trefort, 1. Oaten chaff; W. H. Ingram, 1.

DAIRY PRODUCE.

Cut of beef: Messrs. Clayton and Rentoul, 1. Fresh butter: Mrs. John, 1. Hams: Mrs. Hardy, 1. Sides of bacon: A. Rewell, 1. Duck eggs: W. Graham, 1. Hen eggs: J. G. Cornish, 1. Scones: Miss Newton, 1. Cakes and pastry, girls under 15: Miss Hilda Clayton, 1. Scones, girls under 15: Miss Palmer, 1. Home-made jam, home-made jelly: Mrs. Sewell, first for each.

VEGETABLES.

There was a magnificient display by J. G. Cornish. Cabbages, lettuce, turnips, and carrots: J. G. Cornish, first for each. Potatoes: S. Quinn, 1. Peas and beans: Mrs. Hardy, 1.

POULTRY.

Gander, geese, Malay game rooster and hen, White Leghorn rooster and hen, Brown Leghorn rooster and hen, Golden Wyandotte rooster and hen, Andalusian rooster and hen, Langshan rooster and hen, Black Orpington rooster and hen, and champion cock: A. Keirle, first for each. Aylesbury drake and duck: Mr. Graham, 1. Pekin drake and duck: Messrs. Clayton and Rentoul, 1. Indian Runner drake and duck: Mr. Graham, 1. Minorca rooster and hen: P. J. Turvey, 1. Best pen, cock and three hens: P. J. Turvey, 1.

MACHINERY.

Best farm wagon: T. P. O'Connor, 1. Spring-dray, local make: Messrs. Just & Hardy, 1. Stump-jump plough: Mr. Smith, 1. Seed drill, cultivator, reaper and binder, and horse-rake: The Massey-Harris Co., first for each. Damp-weather stripper: J. Martin, 1. Harvester: Mr. Mackay, 1. Stump-jump harrows, Messrs. R. Purser & Co., 1. Double-seated buggy: Messrs. Just & Hardy, 1. Sulky: T. P. O'Connor, 1.

NEEDLEWORK AND FLOWERS.

Collection of fancy needlework, best tea cosey, mantle drape, fancy table-centre, and bracket drape: Mrs. Green, first for each. Cushion ironed white shirt, hand bouquet, pair of pillow shams, and nightdress satchel: Mrs. Hards, 2. Pair of d'oyleys: Mrs. Glasson, 1. Drawn thread work: Mrs. Morgan, 1. Gent's smoking cap: Mrs. Glasson, 1. Hand-made night-dress; Miss Bushalla, 1. Artificial flowers: Miss Hardy. Gent's hand-knitted socks: Mrs. Walter, 1. Pinafore, girls under 15: Miss Dowsett, 1. Arasene work: Mrs. McBurnie, 1. Hand-made child's dress: Mrs. Petchell, 1. Pincushion, girls under 15: Miss Down, 1. Darning: Miss Ada Chappel, 1. Centre bouquet: Mrs. Hicks, 1. Bridal bouquet: Mrs. Hicks, 1. Buttonholes: Miss Street, 1. Ladies' sprays, Miss Street, 1. Pot plants, Miss Hardy, 1. Cut flowers: Mrs. Morgan, 1. Collection of everlastings: Miss Ivy Jennings, 1. Collection of wild flowers: Miss Ida Street.

BEST COLLECTION OF HARNESS: J. C. H. Nenke.

BEVERLEY AGRICULTURAL SOCIETY'S SHOW.

The thirtieth annual show of the Beverley Agricultural Society was held on 22nd October, in beautiful weather. Although the entries in some of the classes were few in number, great improvement was noticeable in those that were devoted to horses, machinery, flowers, vegetables, and industrial products. That the

show failed to indicate the strength of the district was made manifest in a hasty run around the latter.

The following is the prize list:—

Horses.

Thoroughbred stallion: Mr. G. Duperonzel, 1. Draught entire: Mr. Frazer's "Royal Prince," 1. Western Australian bred draught entire: Mr. Fleay's "Stanley," 1. Western Australian bred draught mare: Mr. B. Robins, 1. Champion mare: Mr. J. W. Brown's "Bet," 1. Draught filly (two years old): Mr. C. C. McQuade, 1. Draught gelding: Mrs. Lukin, 1. Four-horse team: Mr. J. W. Brown, 1. Buggy horse: Mr. G. Duperonzel, 1. Ladies' hack: Mr. G. E. House, 1. Yearling colt: Mr. S. Smith, 1. Gentleman's hack: Mr. G. Duperonzel, 1. Jumping Hack: Mr. G. Duperonzel, 1. High Jump: Mr. G. Duperonzel, 1.

Cattle.

Dairy cow: Mr. J. L. Cumming, 1; Mr. B. Robins, 2. Bull for beef: Mr. C. E. Blechynden, 1. Cow for beef: Mr. B. Robins, 1.

Sheep.

Merino ram: Mr. L. A. Edwards, 1; Mr. Awcock, 2. Champion merino ram: Mr. Edwards, 1. Lincoln ram: Messrs. Marwick Bros., 1; Mr. C. T. Austin, 2. Shropshire ram: Mr. C. T. Austin, 1; Mr. J. Powell, 2. Fat wether: Messrs. Darlington and McDonald, 1. Lincoln ewe: Messrs. Darlington and McDonald, 1. Fat lamb: Mr. C. T. Austin, 1; Mr. J. Fleet, 2. Crossbred ewe: Mr. J. R. Broun, 1. Merino fleece: Mr. W. Smith, 1. Long-wool fleece: Messrs. Marwick Bros., 1.

Pigs.

Mr. S. Smith, 1.

Poultry.

Turkeys: Mr. A. W. Edwards, 1. Geese: Mr. A. W. Edwards, 1. Muscovy ducks: Mrs. Blechynden, 1. Hen eggs: Mrs. Blechynden, 1. Duck eggs: Mrs. Lodge, 1.

Cereals and Produce.

Mr. E. Powell, 1.

Miscellaneous.

Bread: Mrs. E. Secombe, 1. Butter: Mrs. Lodge, 1. Ham: Mrs. Fleet, 1; Mr. C. T. Austin, 2. Bacon: Mr. W. Smith, 1. Vegetables (collection): Mr. J. L. Cumming, 1. (Other winners in this class were Messrs. S. Smith, T. Edwards, E. Powell, F. R. Brown, A. W. Edwards, E. Brockman, and S. Williams.) Collection of flowers: Mrs. Sewell, 1. Red roses: Mr. S. Smith, 1. Yellow roses: Mrs. Langsford, 1. Bouquet of wild flowers: Miss Lennard, 1. Lady's Buttonhole: Miss Madeline Sewell, 1. Gentleman's buttonhole: Miss E. Robinson, 1. Single rose bloom: Mr. S. Smith, 1. Ladies' work prizes were obtained by the following:—Misses B. A. Walker, Lambert, F. E. Williams, E. M. Williams, L. Ferguson, A. McKenzie, and A. Groser; Mesdames H. M. Fisher, Edwards, Monger, and Langsford. Girls' prizes were won by Misses V. Horley, A. McGrath, H. Lodge, C. M. McDonnell, E. Walker, E. Smith, E. Williams, J. Blechynden, V. Edwards, and R. Francis. Boys' prizes were won by Herbert Williams, J. Groser, and P. Whitely (maps), H. Walker (essay), Harry Walker (story), W. Turner and J. Groser (clay modelling), Percy Williams and H. Walker (drawing), W. Turner and H. Walker (home work), H. Walker (carpentry), G. B. Drayton and J. Lodge (Kindergarten).

YORK AGRICULTURAL SOCIETY'S ANNUAL SHOW.

The York Agricultural Society's annual show took place on 24th October, and it was unanimously regarded by residents and visitors, who had had an opportunity of comparing it with displays of former years, as the most successful exhibition of the kind ever held in the district. The weather was fine and the attendance large. The following is the prize list:—

Horses.

Draught entire: Estate of the late Mr. J. H. Monger, "Ailsa Craig," 1; Mr. W. T. Craig's "Royal Blue," 2. Draught mare: Messrs. W. and N. Burges, 1; Mr. T. H. Wilding, 2. Draught colt (two years old): Mr. T. H. Wilding, 1; Messrs. W. and N. Burges, 2. Draught filly (two years): Mr. T. H. Wilding, 1; Mr. John Taylor, 2. Draught colt (one year): Mr. T. H. Wilding, 1; Mr. M. Stone, 2. Draught filly (one year): Messrs. W. and H. Collins, 1; Mr. W. Smith, 2. Draught gelding: Mr. R. G. Burges, 1; Mr. W. Grigson, 2. Draught foal (ten weeks or under): Mr. R. G. Burges, 1. Best two draughts (two years): Mr. T. H. Wilding, 1. Best foal at foot, by "Silverweight": Mr. A. Dinsdale, 1. Best yearling by "Ailsa Craig": Mr. M. Stone, 1. Best yearling by "Royal Blue": Mr. W. H. Collins, 1. Western Australian bred draught entire: Mr. W. T. Craig's "Royal Blue," 1; Messrs. W. and H. Collins, 2. Western Australian bred draught mare: Mr. C. McQuade, 1; Messrs. W. and N. Burges, 2. Blood entire: Mr. G. Duperonzel's "Storm King," 1. Blood mare: Messrs. Marwick Bros., 1. Blood colt (two years): Mr. W. T. Craig, 1. Blood filly (two years): Messrs. Marwick Bros., 1. Buggy Horses.—Best pair driven in harness: Mr. W. T. Craig, 1. Single buggy horse, Mr. W. H. Delisle, 1. Single buggy pony: Mr. S. Pike, 1. Gents' hack: Mr. G. Duperonzel, 1. Lady's hack, Mr. T. H. Wilding, 1. Jumping hack: Mr. W. H. Withnell, 1. High Jump.—Mr. G. Duperonzel, 1; Mr. H. Withnell, 2. Team of four horses: Messrs. W. and H. Collins, 1.

Cattle.

Bull for beef: Mr. A. W. Edgar, 1; Mr. T. H. Wilding, 2. Bull for dairy: Mr. R. G. Burges, 1; estate of late Mr. J. H. Monger, 2. Cow for beef: Mr. A. W. Edgar, 1; Mr. G. Tuomey, 2. Cow in full milk: Mr. R. G. Burges, 1 and 2. Two fat beasts: Mr. T. H. Wilding, 1; Mr. J. W. Parker, 2. Cow in full milk owned and kept in the York district: Mr. R. G. Burges, 1 and 2.

Sheep.

Merino ram: Estate of the late Mr. J. H. Monger, 1 and 2. Two merino ewes: Estate of the late Mr. J. H. Monger, 1 and 2. Champion prize and Society's certificate and ribbon for best merino ram and ewe: Estate of the late Mr. J. H. Monger. Two crossbred ewes: Mr. J. H. Durlacher, 1 and 2. Crossbred ram: Mr. G. Lukin, 1; Mr. R. G. Scott, 2. Shropshire ram: Mr. T. H. Wilding, 1; Mr. R. G. Burges, 2. Two long-wool ewes: Messrs. Darlington and McDonald, 1 and 2. Long-wool ram: Messrs. Marwick Bros., 1 and 2. Champion prize and society's certificate and ribbon for best long-wool ram: Messrs. Marwick Bros. Society's certificate and ribbon for long-wool ewe: Messrs. Darlington and McDonald. Pen of five fat lambs: Mr. T. H. Wilding, 1 and 2. Pen of five fat wethers: Mr. T. H. Wilding, 1; Mr. T. Parker, 2. Best one ram and two ewes (all merino): Estate of the late Mr. J. H. Monger, 1. Best five long-wool lambs: Mr. R. G. Burges, 1; estate of the late Mr. J. H. Monger, 2. Pair of Western Australian bred merino rams: Estate of the late Mr. J. H. Monger, 1.

Pigs.

Berkshire boar: Estate of the late Mr. J. H. Monger, 1. Berkshire sow: Mr. C. A. Harvey, 1; Estate of the late Mr. J. H. Monger, 2.

Agricultural Machinery.

Collection of six implements: Messrs. W. Sandover & Co., 1. Collection of Western Australian manufactured implements: Mr. G. H. Smith, 1.

Poultry.

Indian game cock or cockerel: Mr. K. Edwards, 1; Mr. B. Thomas, 2. Hen or pullet: Mr. K. Edwards, 1 and 2. Malay game cock or cockerel: Mr. James Loughlin, 1; estate of the late Mr. J. H. Monger. 2. Hen or pullet: Estate of the late Mr. J. H. Monger, 1; Mr. Jas. Loughlin, 2. Any other variety of game cock or cockerel: Mr. C. Edwards, 1; Mr. W. L. Hoops, 2. Hen or pullet: Mr. C. Edwards, 1. Brahmapootras, variety, cock or cockerel: Estate of the late Mr. J. H. Monger, 1. Hen or pullet: Estate of the late Mr. J. H. Monger, 1; Mr. R. J. Linto, 2. Langshan, any variety, cock or cockerel: Estate of the late Mr. J. H. Monger, 1. Hen or pullet: Mr. A. Stone, 1; Estate of the late Mr. J. H. Monger, 2. Minorca, any variety, cock or cockerel: Estate of the late Mr. J. H. Monger, 1; Mr. H. Hunter, 2. Hen or pullet: Mr. W. T. Craig, 1; Estate of the late Mr. J. H. Monger, 2. Hamburg, any variety, cock or cockerel: Mr. E. Trew, 1 and 2. Hen or pullet: Mr. E. Trew, 1. Orphington, any variety, cock or cockerel: Mr. J. T. Parker, 1; Mr. H. Hunter, 2. Hen or pullet: Mr. R. J. Linto, 1. Dorking, any variety, cock or cockerel: Mr. B. Thomas, 1; Mr. W. T. Craig, 2. Wyandotte, any variety, cock or cockerel: Estate of the late Mr. J. H. Monger, 1; Mr. A. Stone, 2. Hen or pullet: Estate of the late Mr. J. H. Monger, 1; Mr. A. Stone, 2. Spanish, any variety, cock or cockerel: Estate of the late Mr. J. H. Monger, 1. Hen or pullet: Estate of the late Mr. J. H. Monger, 2. Andalusian, cock or cockerel: Mr. K. Edwards, 1. Leghorn, white, cock or cockerel: Mr. W. Grigson, 1. Hen or pullet: Mr. W. W. Grigson, 1; Mr. J. H. Wansbrough, 2. Leghorn, brown, cock or cockerel: Mr. A. Stone, 1 and 2. Hen or pullet: Mr. A. Stone, 1 and 2. Plymouth Rock, hen or pullet; Mr. A. Stone. 1. Table fowls: Mr. A. Stone, 1. Geese: Mr. W. T. Craig 1; Mr. E. Ashworth, 2. Turkeys: Mr. W. L. Hoops, 1. Ducks, Pekin: Miss E. Myles, 1. Ducks, any other variety: Mr. R. G. Burges, 1.

Agricultural Produce, etc.

Fifty lb. of flour: Messrs. Quigley and Edwards, 1. Fifty lb. of wheat: Mr. A. Grigson, 1. Fifty lb. of barley: Mr. W. Grigson, 1. Fifty lbs. of oats: Mr. R. G. Burges, 1. A sheaf each of wheat, barley, and oats for grain: Mr. F. McCarthy, 1. Chaff: Mr. A. Grigson, 1; Messrs. Marwick Bros., 2. Stool of wheat: Estate of the late Mr. J. H. Monger, 1. Home-made bread: Mrs. R. G. Scott, 1; Mrs. F. Hubble, 2; Miss S. Penny, 3. Butter: Mr. R. G. Burges, 1; Mrs. J. H. Wansbrough, 2; Mrs. H. E. Taylor, 3. Collection of hams and bacon: Mr. C. A. Harvey, 1. One ham (for farmers only): Mr. A. Grigson, 1. Light wine: Mr. C. Crouch, 1. Dark wine: Mr. A. Dinsdale, 1. Preserves: Mrs. Gallop, 1; Miss Grigson, 2. Jams: Mr. W. L. Hoops, 1; Miss Grigson, 2. Carrots and parsnips: Mr. K. Edwards, 1. Turnips: Messrs. H. and J. Carr, 1. Peas and beans: Mr. K. Edwards, 1. Potatoes: Mr. K. Edwards, 1. Cabbage: Mr. J. S. Durlacher, 1. Collection of vegetables: Mr. K. Edwards, 1. Lemons: Mr. K. Edwards, 1. Oranges: Mr. K. Edwards, 1. Apples: Mr. K. Edwards, 1. Hen eggs: Mr. S. Hyde, 1; Mr. K. Edwards, 2. Three merino fleeces: Estate of the late Mr. J. H. Monger, 1. Three crossbred fleeces: Estate of the late Mr. J. H. Monger, 1. Pure bred long-wool fleece: Messrs. Marwick Bros. 1. Scones: Mrs. J. H. Wansbrough, 1. Home-made pastry: Mrs. Stevens, 1.

Flowers.

Six gents.' buttonholes: Mrs. W. F. Congreve, 1; Miss M. Andrews, 2. Three gents.' buttonholes: Miss Ruby Edwards, 1. Hand bouquet of wild flowers: Mrs. Gallop, 1. Hand bouquet of garden flowers: Mr. J. C. Windsor, 1. Collection of garden flowers: Mr. J. C. Windsor, 1; Miss

Andrews, 2. Collection of wild flowers: Mrs. Gallop, 1; Miss O. Smith, 2. Pot plants: Miss M. Andrews, 1; Miss Waldron, 2. District roses: Mr. K. Edwards, 1; Mr. J. C. Windsor, 2. Twelve district roses: Mr. K. Edwards, 1 and 2.

WAGIN-ARTHUR AGRICULTURAL SOCIETY.

The second annual show of the Wagin and Arthur Districts A., H., and F. Society took place on 24th October, on the Wagin show ground, and was a decided success in every respect. The display of stock, vegetables, fodder, dairy produce, preserves, cookery, wine, chaff, and machinery was the best we have seen to date, and reflects every credit upon the energy of the inhabitants and the producing power of the district. A trophy exhibit of a collection of farm produce by Mr. Gell looked excellent, and proves beyond a doubt that the early anticipations of the season will be fully realised. Every credit is due to the secretary, Mr. Nenke, for the energies he put forth, and likewise the committee for the manner in which they assisted in making the show a success.

The following is the prize list:—

Horses.

Blood entire: H. Douglas's "The Idler," 1; T. Cornwall, 2. Blood mare: A. Perkins, 1; B. Orr, 2. Blood yearling: T. Cornwall, 1; J. Watkins, 2. Roadster mare: G. Fidge, 1; W. McKenna, 2. Draught stallion: F. and C. Piesse, 1; T. Cornwall, 2. Draught stallion (Western Australian bred): T. Cornwall, 1; A. Perkins, 2. Draught mare: G. Fidge. Draught mare (Western Australian bred): J. Thompson, 1; F. and C. Piesse, 2. Draught two-year-old: W. Barron. Four-horse team in wagon: W. Watson, 1; G. Taylor, 2. Pair of plough horses in harness: W. Watson, 1; G. Fidge, 2. Springcart horse: G. Fidge, 1; W. McKenna, 2. Buggy pair: J. Spratt, 1; Hill and Watson, 2. Buggy horse: J. Spratt, 1; E. Jull, 2. Tandem team: Spragge and Watson. Sulky pony: A. Chester, 1; E. Hill, 2. Gentleman's hack: J. Barry, 1; W. Duperonzel, 2. Lady's hack: A. Perkins, 1; J. Barry, 2. Boy's pony: A. Chester, 1; F. Piesse, 2. Girl's pony: A. Chester, 1; A. Honer, 2. Hurdle jumper: A. Perkins, 1; Jones and Cavanagh, 2.

Cattle.

Bull, milking strain: F. and C. Piesse. Bull, beef strain: J. Spratt. Dairy cow, in milk: W. Piesse. Pure bred bull, milking strain: F. and C. Piesse. Two year old heifer, J. Spratt.

Poultry.

Pair of Spanish fowls: A. Keirle. Cochins: G. Taylor. Game fowls: A. Keirle. Plymouth Rocks: W. McKenna. Brown Leghorns: A. Keirle, 1; J. Nenke, 2. White Leghorns: A. Keirle. Minorcas: A. Perkins, 1; A. Keirle, 3. Langshans: A. Keirle, 1; J. Taylor, 2. Table fowls: J. Cowcher. Geese: A Keirle, 1; H. Spragge, 2. Ducks: A. Hale, 1; J. Cowcher, 2. Andalusians: A. Keirle, 1, J. Govan, 2. Wyandottes: A. Keirle, 1: J. Taylor, 2. Orpingtons, A. Keirle.

Miscellaneous.

Kangaroo dog: F. Piesse. Sheep dog: Mrs. W. Clark, 1; A. Perkins, 2. Fox terrier: Mr. F. Thornbury. Oranges: C. Piesse. Lemons: C. Piesse. Cape gooseberries: W. McKenna. Collection of vegetables: F. Kunzel.

Carrots: R. Gell. Broad beans: M. Williams. Salad vegetables: F. Kunzel. Rhubarb: A. Cumming. Turnips: F. Kunzel. Lettuce: E. Harvey. Cabbages: Mitchell Bros. Cauliflowers: F. and C. Piesse. Herbs: F. Kunzel. Onions: A. Cumming. Potatoes: R. Gell. Peas: J. Cronin. Collection of Produce, vegetables, cereals, and fruit arranged as a trophy: R. Gell.

GREAT SOUTHERN DISTRICTS PASTORAL AND AGRICULTURAL SOCIETY.

Annual Show.

The annual show of the above society was held on Wednesday, 29th October, at Katanning. The desire of the promoters of the local function to surpass all previous efforts, and at the same time to rank second only to the Royal Society's, was early in evidence, and their desire was fully gratified. From the early morning the rate at which the vehicles began to roll into town soon told, and at one time during the day there were quite 2,000 people on the ground. This is, of course, the record attendance, and it was indeed a gratifying aspect to the secretary and committee.

Following is the prize list:—

Sheep.

Merino ram, any age: A. Nicholson, 1 and 2. Best merino ewe: Holly Bros., 1; Warren Bros., 2. Best pen of fat lambs: Meharry and Sons, 1; E. Beck, 2. Best farmer's merino ram: R. Beeck and Sons, 1 and special. Lincoln ewe, any age: Holly Bros., 1 and 2. Lincoln ram: A. Nicholson, 1 and 2. Pen of Lincoln lambs: Holly Bros., 1 and 2. Pen of merino wethers: E. Beeck, 1; Holly Bros., 2. Pen of five long-wool wethers, shorn: Holly Bros., 1 and special. Shropshire lambs: Holly Bros., 1 and 2. Shropshire ram: Holly Bros., 1; F. and C. Piesse, 2. Shropshire ewe: Holly Bros., 1 and 2.

Horses.

Best blood stallion: Mr. Gilchrist, "Vegetarian," 1; H. Douglas, 2. Blood mare: Mr. Wilcox, "Gambling Maid." Best animal bred in the Southern district: D. Cronin, 1; Holly Bros., 2. Best draught stallion: Holly Bros., "Young Major," 1; Warren Bros., 2. Brood mare: J. McGuire, 1; J. Baker, 2. Two-year-old colt: Warren Bros., 1; Mr. Cronin, 2. Four-horse team, W.A. bred: Holly Bros. Pair horses in plough harness: Ball Bros., 1; A. Nicholson, 2. Four-horse team, open class: Ball Bros., 1; Holly Bros., 2. Best draught brood mare, W.A. bred: W. Quartermaine. Best foal by "Young Major": T. O'Dea, 1; W. Quartermaine, 2. Foal, open class: T. O'Dea. Best roadster entire: Jeffrey Bros. Buggy pair: H. Starr, 1; Holly Bros., 2. Lady's hack: Mrs. Perkins, 1; A. Stewart, 2. Weight-carrying hack: H. Quartermaine, 1; W. Quartermaine, 2. Single buggy horse: Holly Bros., 1; H. Quartermaine, 2. Trotting galloway, ridden by youth: Holly Bros., 1; G. Old, 2. Pony 13·2 a.u.: E. Higgins, 1; F. Beeck, 2. Best-groomed horse (F. Clark, groom): Holly Bros. Spring-cart horse: Hill and Hatton, 1; Holly Bros., 2. High jump: H. Quartermaine, 4ft. 6in., 1; D. Cronin, 2. Hurdles: H. Starr, 1; J. Norrish, 2.

Cattle.

Best cow for beef: W. Baker, 1; Holly Bros., 2. Bull: W. Edgar, 1; A. Nicholson, 2. Bull: W. Edgar, 1; A. Nicholson, 2. Bull for dairy purposes: J. Cook, 1; Holly Bros., 2. Fat beast; Holly Bros, 1; W. Baker,

2. Bull, under two years old: A. Harris. Dairy cow: W. Wise, 1; E. Beeck and Sons, 2. Milking competition: W. Wise, 26½lb.

PIGS.

Best Berkshire boar: H. Carter. Best Berkshire sow: H. Carter. Sow, any breed: F. and C. Piesse. Boar, any breed: Beeck and Sons, 1; F. and C. Piesse, 2.

WILD FLOWERS.

Collection of wild flowers: Miss Cronin, 1; Miss Steere, 2. Best two buttonholes: E. Beeck and Sons, 1; Mrs. Mitchell, 2. Hand bouquet: E. Beeck, 1; R. McDonald, 2.

GARDEN FLOWERS.

Hand bouquet: Mrs. Pemble, 1; E. Beeck and Sons, 2. Best centre bouquet: Mrs. Houston, 1; Miss Vanzuilecom, 2. Best six cut flowers: B. and A. Beeck, 1; R. Bell, 2.

ROYAL AGRICULTURAL SHOW.

The Royal Agricultural Society held their annual show at Guildford on the 4th and 5th inst.

It was agreed on all hands that the Royal Show of 1902 was the finest that has yet been seen in Western Australia. The progress of land settlement and the expansion of its allied industries were abundantly reflected in the extremely fine collection of stock which filled the show pens at Woodbridge. That the widest interest was being taken in the "Royal" was evident from the great number exhibits listed. Never have so many entries been received. Never has the circumscribed area of the show-ground appeared more inadequate for the work it was called upon to do.

Though the opening day is never responsible for a large attendance, it can safely be claimed that more people visited the function on that day than has ever before been the experience of the society on a first day.

On the second day it was early apparent that a great number of people would visit Woodbridge. Those leaving in the earlier trains, hoping by so doing to avoid the crush of the afternoon, found the compartments full of passengers, evidently of the same way of thinking. Until late in the afternoon the trains were packed with holiday-makers, bent upon seeing what is on all hands admitted to have been the best show yet held in Western Australia. By 4 o'clock the show grounds were packed, and the grandstand was full almost to overflowing with an ever-changing, expectant crowd. Viewed from the railway station, the sight was indeed impressive. The crowded grandstand, flecked with blazes of colour, formed a striking background. In the forefront people stood five and six deep around the ring, while the machinery exhibits and the stock pens were the centre of hundreds of visitors. It is estimated that twelve thousand persons were present between three and four o'clock. So far as the patronage accorded to it by the general public was concerned, the Royal Show of 1902 establishes a record.

The general parade, which took place shortly after 1 o'clock, was a brilliant success. Thousands of spectators lined ropes encircling the ring, and appreciatively took stock of the noble animals which were led around. Mr. Edgar's striking and handsome Shorthorns commanded general admiration, comments as to their fine appearance being audible on all sides. The horses were also eagerly scanned—Ormuz, the thoroughbred champion, and Royal Blue, the victor in the draught entire section, coming in for special attention. Mr. Craig's fine Clydesdale made numbers of friends, and it was the verdict of the "horsey" people present that a finer cart stallion has not been seen in a West Australian ring. The York champion was sought by a would-be buyer, but the offer of £300 failed to tempt the owner, so Royal Blue will return to his home in the Avon Valley.

The following is the prize list:—

Cattle.

Beef Cattle (Shorthorns).

Bull, three years and over: A. W. Edgar, 1 and 2. Bull, two years and under three years: A. W. Edgar, 1 and 2. Bull, one year and under two years: A. W. Edgar, 1; E. Roberts, 2. Bull, under 12 months: A. W. Edgar, 1 and 2. Cow, three years old or over: A. W. Edgar, 1; E. Roberts, 2. Heifer or cow, two years and under three years: A. W. Edgar, 1 and 2. Heifer, one year and under two years: A. W. Edgar, 1 and 2. Heifer, under 12 months: A. W. Edgar, 1; E. Roberts, 2. Pair shorthorns, bull and heifer: A. W. Edgar, 1. Cow, three years or over: J. Drummond, 1; W. Padbury, 2. Heifer, over one year and under two years: J. Drummond, 1.

Polled Angus.

Cow, three years or over: E. Roberts, 1 and 2. Best fat beast in any of the above classes: E. Roberts, 1 and 2.

Dairy Cattle (Ayrshire).

Bull, three years or over: Maud Dempster, 1; E. W. Loton, 2. Bull, one year and under two years: E. W. Loton, 1 and 2. Bull, under 12 months: E. W. Loton, 1 and 2. Cow, three years or over: Maud Dempster, 1; R. G. Burges, 2. Heifer or cow, two years and under three years: E. W. Loton, 1 and 2. Heifer, one year and under two years: E. W. Loton, 1 and 2. Heifer, under 12 months: E. W. Loton, 1 and 2. Heifer in milk, three years old: E. W. Loton, 1 and 2.

Jersey.

Bull, three years or over: C. N. Kidman, 1. Bull, two years and under three years: J. W. Mills, 1. Bull, one year and under two years: A. Cameron, 1: W. Traylen, 2. Bull, under 12 months: J. Minchin, 1; E. J. Anderson, 2. Cow, three years or over: C. Crossland, 1; J. Morrison, 2. Heifer or cow, two years and under three years: J. Morrison, 1. Heifer, one year and under two years: J. Morrison, 1. Champion bull best fitted for getting beef cattle: A. W. Edgar. Champion bull best fitted for getting dairy stock: Maud Dempster. Champion cow best fitted for breeding beef cattle: A. W. Edgar. Champion cow best fitted for breeding dairy stock: Maud Dempster. Champion Jersey bull: J. W. Mills. Champion Jersey bull: Maud Dempster. Champion Jersey cow or heifer: Charles Crossland. Champion Ayrshire cow or heifer: Maud Dempster.

Sheep.

Merino (Open).

Ram, two years or over: G. C. Rose, 1; Maud Dempster, 2. Ram, one and a-half years or under: Dalgety & Co., 1; Maud Dempster, 2. Ewe, two years or over: Newmarracarra, 1; Maud Dempster, 2. Ewe, one and a-half years or under: W. V. Sewell, 1; Maud Dempster, 2.

Bred in Western Australia.

Ram, two years or over: Dalgety & Co., 1 and 2. Ram, one and a-half years or under: Dalgety & Co., 1 and 2. Ewe, two years or over: Dalgety & Co., 1; W. V. Sewell, 2. Ewe, one and a-half years or under: Newmarracarra Co., 1; W. V. Sewell, 2. Special for best ram, not over 6 tooth in any of the above classes: Newmarracarra Estate, 1; W. J. Sewell, 2. Champion prize for best ram in any classes: G. C. Rose. Champion prize for best ewe in any class: Newmarracarra Co.

Coarse Wool (Open).

Lincoln ram, two years or over: Maud Dempster, 1, Marwick Bros., 2. Leicester ram, two years or over: H. W. Venn, 1. Leicester ram, one and a-half years or under, H. W. Venn, 1. Shropshire ram, two years or over: J. P. O. Wellard, 1 and 2. Shropshire ram, one and a-half years or under: H. Wills & Co., 1; A. W. Edgar, 2. Romney Marsh ram, two years or over: H. J. Saunders, 1, Dalgety & Co., 2. Lincoln ewe, two years or over: H. Wills & Co., 1, Dalgety & Co., 2. Leicester ewe, two years or over: A. R. Adam, 1 and 2. Leicester ewe, one and a-half years or under: A. R. Adam, 1 and 2. Shropshire ewe, two years and over: J. P. O. Wellard, 1 and 2. Shropshire ewe, one and a-half years or under: H. Wills & Co., 1; A. W. Edgar, 2. Romney Marsh ewe, two years or over: Not worthy of a prize. Champion for best ram exhibited in classes for Lincoln, Leicester, and Romney Marsh: H. W. Venn, 1. Champion for best ram exhibited in Shropshire and Southdown: H. Wills & Co. Champion for best ewe in Lincoln, Leicester, and Romney Marsh: A. R. Adam. Champion for best ewe in Shropshire and Southdown: H. Wills & Co.

Fat Sheep (bred in Western Australia).

Pen of five merino wethers: T. H. Wilding. Pen of five coarse-wool wethers: J. P. O. Wellard, 1; T. H. Wilding, 2 and 3. Pen of five coarse-wool lambs (ewes or wethers), dropped after April 1, 1902: J. P. O. Wellard, 1 and 3; A. W. Edgar, 2. Shorn (ribbed and quartered) sheep or lambs exhibited in Classes 29-31: T. H. Wilding, 1 and 2. Three fleeces of merino wool grown in this State, number of days' growth of wool to be stated: Newmarracarra Estate, 1; C. K. Davidson Uhr, highly commended. Three fleeces of merino wool, grown North of 26th parallel, South latitude: Anderson Bros.

Horses.

Thoroughbreds (Open).

Stallion: Cockram and King's "Ormuz," 1; Isaac Wood's "Jay Rye," 2. Mare, in foal or with foal at foot: E. Robert's "Florrie," 1; Cockram and King's "Miss Tranter," 2.

Bred in Western Australia.

Stallion: C. N. Kidman's "Carbineer." Colt, two years old: Jas. Drummond's "Destra," 1; W. T. Moore's "Erl King," 2. Mare, in foal or with foal at foot: Maud Dempster, 1; W. T. King, 2. Filly, two years old: E. Roberts, 1; H. W. Venn, 2. Champion thoroughbred stallion in any class: Cockram and King's "Ormuz." Champion thoroughbred mare in any class: E. Roberts's "Florrie."

Draughts.

Stallion, any age: W. T. Craig's "Royal Blue," 1; Maud Dempster's "Sir Simon," 2. Stallion, under three years: H. Wills and Co., 1; A. R. Adam, 2. Mare, any age, in foal or with foal at foot: T. H. Wilding, 1; Mrs. Burkenshaw, 2. Mare, any age, not necessarily in foal: H. F. Throssell, 1; Jas. Spiers, 2. Gelding, any age: W. Watson, 1; Whittaker Bros., 2.

Bred in Western Australia.

Stallion, three years or over: H. J. Saunders's "Wellington," 1; Taylor Bros.' "Lord Roberts," 2. Stallion, two years: T. H. Wilding, 1; W. and A. Burges, 2. Yearling stallion: Maud Dempster, 1; T. H. Wilding, 2. Mare, any age, with foal at foot: W. and A. Burges. Two-year-old filly: T. H. Wilding. Yearling filly: T. H. Wilding, 1; Maud Dempster, 2.

Carriage Horses, Hacks, Ponies, etc.

Tandem turnout, 14·2 or over: J. C. Port, 1; Mrs. Rischbeith, 2. Trotting pony, not over 14 hands: P. F. Traylen, 1; W. Foy, 2. Pony, not over 13·2: J. L. Donaldson, 1; R. Hummerston, 2. Pair ponies, not over 13·2: J. C. Port, 1. Four-in-hand: H. J. Saunders, 1. Lorry pair, light: H. H. Stinton, 1; W. A. Brewery, 2. Lorry pair, heavy: W. McCormack, 1. Hunter, to carry not less than 13st.: F. C. Thomas and Co., 1; W. H. Dunstan, 2. Hunting pony, not exceeding 14·2: H. G. Stirling, 1; J. Best, 2. Spring-cart horse: D. Milne, 1. Tip-dray turnout: H. H. Stinton, 1; W. Whittaker, 2.

Pigs.

Berkshires.

Boar, over 12 months: H. J. Saunders, 1; J. Morrison, 2. Sow, over 12 months: H. J. Saunders, 1; J. Morrison, 2. Boar, 12 months or under: Ethel Anderton Gledhill, 1; J. Faulkner, 2. Sow, 12 months or under: J. Morrison, 1 and 2. Sow, any age, in milk, with litter: H. J. Saunders, 1; J. Morrison, 2.

Yorkshires (Large).

Boar, over 12 months: G. W. Stubbs, 1 and special. Sow, over 12 months: G. W. Stubbs, 1 and special. Boar, 12 months or under: G. W. Stubbs, 1. Sow, 12 months or under: G. W. Stubbs, 1.

Miscellaneous.

Boar, any other breed, 12 months or over: C. Cook, 1. Sow, any other breed, 12 months or over: G. M. Richardson, 1; G. W. Stubbs, 2. Pen three porkers, any breed, not over four months old: G. M. Richardson, 1; G. W. Stubbs, 2. Champion Berkshire boar: H. J. Saunders. Champion Berkshire sow: H. J. Saunders. Champion Yorkshire boar (large): G. W. Stubbs. Champion Yorkshire sow (large): G. W. Stubbs.

Poultry.

Dorking cock or cockerel (any colour): J. Couston, 1. Dorking hen or pullet (any colour): W. Padbury, 1. Indian game hen or pullet: R. Taylor, 1. Hamburg cock or cockerel (silver or golden spangled): W. Padbury, 1. Hamburg hen or pullet (silver or golden spangled): W. Padbury, 1 and 2. Wyandotte cock or cockerel (golden): J. Couston, 1; Mrs. Seckold, 2. Wyandotte hen or pullet (golden): Mrs. Seckold, 1 and 2. Wyandotte cock or cockerel (silver): H. Osborne, 1; W. Ah Sing, 2. Wyandotte hen or pullet (silver): Mrs. Seckold. Plymouth Rock hen or pullet: W. Padbury, 1 and 2. Leghorn hen or pullet (brown): A. Coultas, 1; S. J. Hyde, 2. Leghorn cock or cockerel (white): H. Cavanagh. Leghorn hen or pullet (white): H. Cavanagh, 1 and 2. Langshan cock or cockerel: Not worthy of prize. Langshan hen and pullet: W. Padbury, 1 and 2. Andalusian cock or cockerel: Mrs. G. A. Herd, 1 and 2. Andalusian hen or pullet: Mrs. G.

A. Herd, 1 and 2. Orpington cock or cockerel (rose comb): W. Padbury. Orpington hen or pullet (rose comb): W. Padbury, 1 and 2. Orpington cock or cockerel (single comb): W. Padbury, 1 and 2. Orpington hen or pullet (single comb): W. Padbury, 1 and 2. Minorca cock or cockerel: W. Padbury, 1; G. A. Coultas, 2. Minorca hen or pullet: J. Couston, 1; G. A. Coultas, 2. Any variety of fowl not previously stated, cock and hen: F. Cookworthy, 1; A. D. Bell, 2. Aylesbury drake: G. A. Coultas. Aylesbury duck: G. A. Coultas. Pekin drake: J. and A. Ellis. Pekin duck: J. and A. Ellis. Rouen drake: J. and A. Ellis. Rouen duck: J. and A. Ellis. Pair ducks (any other variety): Mrs. J. S. Niland, 1 and 2. Pair geese (any variety): W. Anderson, 1; W. Padbury, 2. Pair American bronze turkeys: J. and A. Ellis.

Bees, Honey, etc.

Italian queen and progeny: Guildford Bee Company. Queen and progeny (bred in the State): Guildford Bee Company, 1; J. Sutton, 2. Observatory hive of modern construction (with bees at work): Government Industrial School, Subiaco, 1; J. Sutton, 2 Beehive, including frames and ready for use (made in the State): Government Industrial School, Subiaco. Extracted honey (liquid or clear): C. and A. H. Smith, 1 and 2. Extracted honey (liquid or clear), in 2lb. tins. C. and A. H. Smith, 1 and 2. Granulated honey: C. and A. H. Smith, 1; Guildford Bee Company, 2. Six sections of comb honey: C. and A. H. Smith, 1 and 2. Comb foundation (made in Western Australia): C. and A. H. Smith. Natural yellow beeswax: Guildford Bee Company, 1; Government Industrial School, Subiaco, 2. Natural white beeswax: Guildford Bee Company.

Agricultural Produce (Grown in W.A.)

Wheat: D. Milne, 1 and 2. Malting barley: Swan Brewery, 1 and 2. Algerian oats: A. R. Adam, 2 (no first). Mangolds, J. Morrison, 2 (no first): Swedes: T. J. Niland, 1; J. Minchin, 2. Flour: D. Milne, 1 and 2. Bran. D. Milne, 1. Pollard: D. Milne, 1. Hay: D. Milne, 1; W. Padbury, 2. Straw: D. Milne, 1. Chaff: D. Milne, 1 and 2. Pumpkin (cattle): C. Harper, 1. Special prize of £10 for the best three acres of Paspalum Dilatatum: M. T. Padbury.

Dairy Produce (Produced in W.A.)

Fresh butter: M. Dempster, 1; W. Padbury, 2. Butter (bulk): J. P. O. Wellard, 1; J. A. McFarlane, 2. Hen eggs: T. Harkness, 1; W. Padbury, 2. Duck eggs: H. Schramm, 1; W. Padbury, 2.

Wines.

Dry red (light, 1902 vintage): C. W. Ferguson, 1 and 2; Laynter & Co., 3. Dry red (full-bodied, 1902 vintage): C. W. Ferguson, 1; W. and H. Logue, 2; Santa Rosa Co., 3. Dry red (light, 1901 or older vintage): R. W. Hardey, 1 and 2; C. W. Ferguson, 3. Dry red (full-bodied, 1901 or older vintage): Cholmondley and Bosanquet, 1; W. and H. Logue, 2 and 3. Dry white (light, 1902 vintage): R. W. Hardey, 1 and 2; C. W. Ferguson, 3. Dry white (full-bodied, 1902 vintage): W. and H. Logue, 1 and 2; Santa Rosa, 3. Dry white (light, 1901 or older vintage): W. and H. Logue, 1 and 2; R. W. Hardey, 3. Dry white (full-bodied, 1901 or older vintage): Santa Rosa Co., 1; W. and H. Logue, 2 and 3. Sweet red (1902 vintage): W. and H. Logue, 1 and 2; C. W. Ferguson, 3. Sweet red (1901 or older vintage): R. W. Hardey, 1; C. W. Ferguson, 2 and 3. Sweet white (1902 vintage): C. W. Ferguson, 1, 2, and 3. Sweet white (1901 or older vintage): C. W. Ferguson, 1, 2, and 3. Champion Wine Cup (for exhibitor obtaining highest number of points): C. W. Ferguson, 38 points, 1; W. and H. Logue, 35 points, 2.

Dried Fruits (Produced in W.A.)

Case of loose raisins: W. Newman, 1. Dried figs: Mrs. J. Wallis, 1.

Fruits (Grown in W.A.).

Oranges: Illawarra Orchard Co., 1. Navel Oranges: Illawarra Orchard Co., 1 and 2. Mandarines: G. H. Palmateer, 1. Lemons: Whistler Bros., 1; Illawarra Co., 2. Loquats: W. Newman, 1; J. Wellman, 2. Cape gooseberries: W. Wellman, 1. Strawberries (Edith): Mrs. J. Wallis, 1; R. Urch, 2. Strawberries (three varieties): J. Schmidt, 1 and 2. Strawberries (any new variety, not previously exhibited): G. H. Palmateer. Apples (dessert): Illawarra Co., 1 and 2. Apples (cooking): Illawarra Co., 1 and 2.

Vegetables.

Vegetables (named): John Wellman, 1; Nicol Bros., 2. Carrots: R. Luke, 1; Nicol Bros., 2. Carrots (shorthorn): F. Howell, 1; J. Wellman, 2. Beet (red, Globe): J. Wellman, 1; W. Newman, 2. Beet (other): Nicol Bros., 1; W. Newman, 2. Vegetable marrows: Nicol Bros., 1; W. Newman, 2. Pumpkins (bugle): C. Harper, 1. Pumpkins (other): J. Wellman, 1; C. Harper, 2. Beans (French): R. Luke, 1; J. Wellman, 2. Beans (broad): R. Luke, 1; J. Wellman, 2. Celery: Nicol Bros. Salad vegetables: W. Newman, 1; Nicol Bros., 2. Rhubarb: Nicol Bros., 1; W. Rason, 2. Parsnips: R. Luke 1; F. Howell, 2. Turnips (white): W. Newman, 1 and 2. Turnips (yellow): W. Newman, 2; no first award. Swedes: W. Newman, 1 and 2. Lettuce (cos): W. Newman, 1 and 2. Lettuce (other): J. Wellman, 1; H. Gull, 2. Cabbage: W. Newman, 1; R. Luke, 2. Cauliflowers: C. Wellman, 1; Nicol Bros., 2. Cabbage (red): Nicol Bros., 1: W. Newman, 2. Leeks: Nicol Bros., 1; J. Wellman, 2. Herbs (collection): J. Wellman, 1; W. Newman, 2. Onions: Nicol Bros. Onions (green): R. Luke, 1 and 2. Garlic: C. Fauntleroy, 1; C. Harper, 2. Shalots: W. Anderson, 1; W. Newman, 2. Potatoes (collection of four varieties): J. Wellman, 1; W. Padbury, 2. Potatoes (collection of two varieties): Nicol Bros., 1; W. Newman, 2. Potatoes (kidney): F. Howell, 1; J. Wellman, 2. Green peas: R. Luke, 1; F. Howell, 2. Asparagus: Nicol Bros., 1; C. Harper, 2. Radishes: W. Newman, 1 and 2.

Carriages, etc.

Other good exhibits were shown by Daniel White & Co. and Mr. Cockburn. The prize list in this section is as under:—

Single buggy (with hood): Bolton & Sons, 1; W. Foy, 2. Single buggy (without hood): D. White & Co., 1; Bolton & Sons, 2. Double buggy (with hood): D. White & Co., 1. Double buggy (without hood): Bolton & Sons, 1; D. White & Co., 2. Double-seated wagon (express or otherwise): D. White & Co., 1; T. Hooper, 2. Single buggy (of any description): D. White & Co., 1. Dray: M. Frost, 1. Spring cart: D. White & Co., 1; Joseph Rhodes, 2. Dog cart: D. White & Co., 1. Sulky: D. White & Co., 1; Bolton & Sons, 2; Victoria Carriage Co. and R. Cockburn, special prizes. Spring dray: D. White & Co., 1.

The judges recommended special certificates:—D. White & Co., phaeton, in white, as a fine piece of work; Bolton & Sons, for finished phaeton; Rhodes, for good useful lorries; James & Turner, for carriage trimmings.

Industrial (Produced in W.A.).

Collection of pickles: T. C. Neaves, 1. Collection of sauces: T. C. Neaves, 1. Collection of chutney: T. C. Neaves, 1. Collection of jam: G. W. Wellman, 1; T. C. Neaves, 2. Home-made bread (three loaves): W. Anderson 1. Colonial ale: Castlemaine Brewery, 1; Don Bottling Works, 2. Colonial porter: Eclipse Brewery, 1; Swan Brewery, 2. Aerated waters: D. Kreyts, certificate. Artificial manures: Gardner Bros. (Cumming, Smith, & Co.), 1, and highly recommended. Collection of pottery: Kirton Pottery Co., certificate.

Horses in Action.

The prize list in this class is as follows:—

Pony (driven, not over 14·2): Bickford & Smyth, 1; R. Hummerston, 2. Pony (ridden or driven, not over 10·2): J. Pearse, 1; Cockram & King, 2. Pony (ridden or driven, not over 12·2): J. L. Donaldson, 1; B. Smith, 2. Smallest pony on the ground (ridden or driven): A. Lake, 9 hands 3¾ inches, 1; Cockram & King, 2. Pony pair (driven, not over 14·2): Mrs. Rischbeith, 1; J. C. Port, 2. Trotter (driven): H. Hummerston, 1; R. Hummerston, 2. Carriage horse (over 15·2): Dr. McWilliams, 1; N. McNeil, 2. Gents' hacks (11 stone): L. Clarkson's "Lang Syne," 1; W. Matthew's "Carrick," 2. Single harness horse (15·2 or under): E. F. Darlôt's "Gladstone," 1; R. Hummerston, 2. Pair of carriage horses (over 15·2): N. McNeil. Private pony turnout (not over 14·2, driven by a lady): Bickford & Smyth (driven by Mrs. Badock), 1; Mrs. J. C. Port, 2. Gents' hacks (13 stone): Colonel Ricardo's "Dandy" (owner), 1; H. H. Stinton's "Nigger" (owner), 2. Single harness horse: E. F. Darlôt's "Gladstone," 1; H. Hummerston's "Pretoria," 2. Lady's hacks: Mrs. W. G. Brookman (rider, Mrs. Monger), 1; T. H. Wilding (Miss Hancock), 2. Lady's turnout: Miss Darlôt, 1; Mrs. Monger, 2. Trotter (pace): H. Hummerston, 1; J. Tyler, 2. Pair harness horses (15·2 or under): H. J. Saunders, 1 (three competitors); the judge decided not to award a second prize. Lady's hunter: Dunstan's "Troubadour" (Miss Harkness), 1; F. Thomas's "Strongbow" (Mrs. Monger), 2; L. Clarkson's "Lang Syne" (Miss Clarkson), 3. Hunter (11 stone): L. Clarkson's "Lang Syne" (owner), 1; Throssell's "Horace" (Cousins), 2. High jump (catch weights): Clarkson's "Larrikin" and Thomas's "Strongbow" equal, each failing to jump over 5ft. 5in., after all the other competitors had retired at an earlier stage.

KOJONUP AGRICULTURAL SOCIETY'S SHOW.

The fifth annual show of the Kojonup Agricultural and Horticultural Society was held on the 6th inst., under very favourable conditions. The weather was fine, and the attendance numbered about 500. Mr. A. Y. Hassell, M.L.A., and Mr. C. A. Piesse, M.L.C., were among those present. In all, 560 entries were received for all classes, an increase, as compared with last year, of nearly a hundred.

The following were the principal prize-winners:—

Sheep.

Merino ram: Messrs. I. F. Vanzulicom and Sons, 1. Merino ewe: Mr. F. Bildey, 1. Shropshire ewe: Mr. J. M. Flanagan, 1. Pen of three fat wethers: Mr. W. T. Jones, 1. Pen of three fat lambs: Mr. W. T. Jones, 1.

Cattle.

Best bull for dairying purposes: Messrs. Vanzulicom and Sons, 1; Mrs. Treasure, 2. Bull for beef: Mr. Bildey, 1; Mr. F. Watts, 2. Dairy cow: Mr. J. Geale, 1; Mr. W. T. Jones, 2. Cow for beef: Mr. J. R. Tunney, 1. Heifer: Mrs. Treasure, 1; Mr. W. T. Jones, 2. Pen of three heifers: Mr. W. T. Jones, 1; Messrs. Treasure Bros., 2. Pen of three cows: Mr. J. R. Tunney, 1; Mr. F. Watts, 2. Calf (by Government bull): Mrs. Treasure, 1; Mr. Judds, 2. Heifer (by Government bull): Mrs. Treasure, 1; Mr. Jones, 2.

Horses.

Blood entire: Mr. J. Gilchrist's "Vegetarian," 1; Mr. J. R. Tunney's "Langar," 2. Blood mare: Mr. J. R. Norrish's "Althea," 1; Messrs. Treasure Bros.' "Gipsy Maid," 2. Draught entire (W.A. bred): Mr. R. Burridge, 1; Messrs. Treasure Bros., 2. Draught mare: Messrs. Treasure Bros., 1 and 2. Two-year-old, yearling, brood mare, pair of plough horses, and team of four horses: Messrs. Treasure Bros., first for each. Champion draught entire: Mr. R. Burridge's "Miller's Lad," 1; Messrs. Treasure Bros.' "Royal Hero," 2. Champion mare: Messrs. Treasure Bros., 1 and 2. Messrs. J. R. Norrish, J. R. Tunney, Treasure Bros., and Holly Bros. divided the prizes in the hack section.

Miscellaneous.

Mrs. H. Ladyman secured first for 14lbs. of butter, with Mr. W. T. Jones second, while the honours for bread fell to Miss Dearle and Mrs. T. Norrish. Messrs. J. Dearle, O. Bignell, and Vanzulicom and Sons secured the prizes for agricultural produce, while Messrs. F. Bildey, Warren Bros., Vanzulicom and Sons, and W. T. Jones won the wool prizes. The prizes for vegetables were secured by Messrs. Bilston Bros., with Mr. J. M. Flanagan second.

DARLING RANGE VINE AND FRUIT GROWERS' ASSOCIATION SHOW.

Gooseberry Hill was visited on Monday, the 10th inst., by some thousands of holiday-makers from Perth, Fremantle, and the suburbs, who attended the fourth annual show, which was held in the Kalamunda Hall, under the auspices of the Darling Range Vine and Fruit Growers' Association.

The following is the prize-list:—

Flowers.

Judge: Mr. E. J. Bickford.

Special prize for collection garden cut flowers (white): Mrs. W. H. Mead, 1; Mrs. Collins, 2. Special prize for collection garden cut flowers (coloured): Mrs. O. E. Owen, 1; Mrs. Collins, 2. Hand bouquet: Mrs. O. E. Owen, 1; Mr. R. Worthe, 2. Lady's spray: Mrs. O. E. Owen, 1; Mrs. W. H. Mead, 2. Gentleman's button-hole: Miss Amy Mead, 1; Mrs. W. H. Mead, 2. Collection everlastings: Miss E. J. P. Mead, 1; Miss Edie Stirk, 2. Fern in pot (any other variety): W. T. Mason, 1; W. T. Mason, 2. Collection of orchids (wild): Miss A. Mead, 1; Miss E. Mead, 2. Collection of kangaroo paws: Miss E. Mead, 1; Miss A. Mead, 2. Collection of wild flowers: Miss Schmitt, 1; Miss E. Mead, 2. Collection of roses (not less than three varieties): Mrs. O. E. Owen, 1; Miss J. Hancock, 2. Collections of carnations (not less than three varieties): Mrs. G. H. Palmateer, 1; A. Jecks, 2. Pot plant (foliage): Mrs. Urch, 1; S. Burkhardt, 2. Pot plant (bloom): S. Burkhardt, 1. Collection of pressed wild flowers: Miss E. J. P. Mead, 1; Miss H. Stirk, 2. Basket of everlastings: Miss E. J. P. Mead, 1; M. Handcock, 2. Collection of wild flowers: Miss Eva Stirk, 1; Miss M. Pumphery, 2. Collection of everlastings: Miss Dolly Schmitt, 1; W. Hancock, 2.

Industrial.

Judge: Mrs. J. C. G. Foulkes.

Six scones: Miss M. Collins, 1; K. Weson, 2. Six currant buns: Mrs. C. Ashcroft, 1; Mrs. W. Patterson, 2, Plain cake, 1lb.: M. Collins, 1; Mrs.

Bryant, 2. Sponge cake: H. Stirk, 1; Mrs. J. McRae, 2. Fruit cake: Mrs. Bryant, 1; Eliza Stirk, 2. Swiss roll: Mrs. O. E. Owen, 1; Mrs. J. McRae, 2. Victoria sandwich: Mrs. O. E. Owen, 1; Eliza Stirk, 2. Collection of preserved fruit in syrup: Mrs. C. Ashcroft, 1; Mrs. G. H. Palmateer, 2. Collection home-made jam: Mrs. G. H. Palmateer, 1; Mrs. W. Patterson, 2. Home-made bread: Mrs. C. Ashcroft, 1; Mrs. Hancock, 2. Home-made butter: Mrs. J. McRae, 1; Mrs. G. H. Palmateer, 2. Home-made pickles: Mrs. C. Ashcroft, 1; Mrs. G. H. Palmateer, 2. Home-made sauces: Mrs. C. Ashcroft, 1; Mrs. G. H. Palmateer, 2. Seven pounds honey: Guildford Bee Co., 1. Eleven pounds section honey in comb: Guildford Bee Co., 1. Bacon: Mrs. Schunke, 1; Mrs. G. H. Palmateer, 2. Twelve duck eggs: W. T. Mason, 1. Twelve hen eggs: T. Fernihough, 1; Mrs. Stirk, 2. Woolwork: Jane Hancock, 1; Edie Stirk, 2. Hand-made article, plain sewing: Dolly Schmitt, 1; M. Pumphrey, 2. Fancy needlework: Miss Smith, 1; Miss Urch, 2. Wild flower paintings: R. Brady, 1; Miss M. A. Young, 2. White cotton crochet: Jane Hancock, 1; Miss Burford, 2. Children under 14: Best dressed doll: Violet Marsh, 1; Nellie Fox, 2. Best article, plain sewing: Miss Hancock, 1.

Vegetables.

Judge: Mr. T. James.

Collection of vegetables, seven varieties or more: W. Patterson, 1; W. H. Mead, 2. Collection of potatoes, three varieties or more: W. H. Mead, 1; W. Patterson, 2. Potatoes, 7lb.: W. H. Mead, 1; W. Patterson, 2. Cabbage, three heads: Mr. Urch, 1; A. Jecks, 2. Turnips, two bunches, three in bunch: J. Wallis, 1; W. H. Mead, 2. Swedes, two bunches, three in bunch: G. H. Palmateer, 1. Carrots, three in bunch, three bunches: R. Grey, 1. Parsnips, two bunches, three in bunch: G. H. Palmateer, 1. Green peas, 4lb.: J. McRae, 1; Jno. Wallis, 2. Broad beans, 4lb.: W. H. Mead, 1; Jno. Wallis, 2. Radish, two bunches, three in bunch: J. Schmitt, 1. Rhubarb, 4lb.: T. Hunter, 1; T. Hunter, 2. Pumpkin: R. Worthe, 1; A. P. Hunter, 2. Sheaf of green wheat for hay, 9in. in diameter: J. Wallis, 1. Sheaf of green oats for hay, 9in. in diameter: F. Wallis, 1; H. Reed, 2.

Wines.

Judge: Mr. T. James.

Dry red, light, 1902 vintage: S. Burkhardt, 1; J. Schmitt, 2. Dry red, full bodied, 1902 vintage: J. Ardwin, 1; J. Schmitt, 2. Sweet red, 1902 vintage: J. Wallis, 1.

Fruit.

Judge: Mr. A. Douglas.

Special Prizes: Prize of 21s., presented by Mr. M. H. Jacoby, M.L.A., for best exhibit of strawberries (1lb.) in the show: F. Stirk, 1. Prize of 21s., presented by Mr. W. Padbury, for best collection of fruit (not less than six varieties): A. E. Annetts, 1; G. H. Palmateer, 2. Prize of 21s., presented by Messrs. Silbert & Sharp for best collection of strawberries (not less than three varieties): R. Urch, 1. Prize of 21s., presented by the association, for 1lb. of any other variety not previously exhibited at the Darling Range Show: C. Ashcroft, 1. Ordinary class: Twelve mandarins: G. H. Palmateer, 1 and 2. Twelve Washington navels: H. Reed, 1; J. McRae, 2. Twelve of any other orange: R. Urch, 1; Illawarra Orchard Co., 2. Twelve lemons: A. E. Annetts, 1; G. H. Palmateer, 2. Twelve citronelles: Mrs. J. H. King, 1; J. McRae, 2. One pound Trollope's Victoria: R. Urch, 1; W. T. Mason, 2. One pound Sir Joseph Paxton: F. Stirk, 1; W. T. Mason, 2. One pound Edith Christy: F. Stirk, 1; John Wallis, 2. One pound Laxton's Noble: A. Wheelwright, 1; F. Stirk, 2. One pound The Creswell: A. P. Hunter, 1; J. McRae, 2. One pound Sharpless: C. Ashcroft, 1; O. E. Owen,

2. One pound Marguerite: R. Urch, 1. Bunch bananas: S. Burkhardt, 2. Four pounds loquats: J. McRae, 1; G. H. Palmateer, 2. Twelve apples: Illawarra Orchard Co., 1 and 2. Three pounds Cape gooseberries (shelled): M. J. H. Mead, 1; J. Schmitt, 2. Twelve passion fruit: C. Ashcroft, 1; G. H. Palmateer, 2. Collection of dried fruits (not less than six varieties): Mrs. Wallis, 1; G. H. Palmateer, 2.

NORTHAM SHOW.

The Hon. the Minister for Lands, Dr. Jameson, in responding to the toast of the Ministry at the Annual Show held at Northam last month said:—"They did not forget the agricultural industry, as would be seen in their new Agricultural Bank proposals. In this it was proposed that loans up to three-quarters of the value of his land and improvements should be allowed the farmer. Such arrangements were very liberal, and would be of great benefit to the industry. It had been suggested that the generally fair condition of the crops in such a low rainfall period as they had just experienced was due to the moisture stored in the soil from the excess of the previous season. Last year, however, had been also a dry year, so that the suggestion would not hold. He thought that the good results under such unfavourable conditions were due to the climate of the district, and to the land, of which it had the largest area of first-class soil to be found in the State. Dr. Jameson referred in terms of eulogy to the splendid example in agricultural development offered to newcomers from Eastern Australia, and particularly those from South Australia, in portions of which State the low yield compelled them to exercise every economy. He thought that the introduction of such new blood might have largely caused the great advancement which Northam and district had seen during recent years. Perhaps this was not a very patriotic statement, but he was a believer in the efficacy of new blood. The great aim of the Government was to induce settlement from the East, and already a large measure of success had attended their efforts. Once they had the population, it would be a case of having the land, the men, and the money too, and under these favouring conditions the Avon Valley should develop and become the most advanced part of W.A. Referring to the subject of agricultural education, the Minister dwelt upon the importance, not only of early seeding, but of the employment of a seed which would mature early and ensure good crops. In the Agricultural Department they went to great trouble in this question, having found that so much depended upon the use of proper seed wheat. They were carefully watched in their growth, and the heads of those which ripened early were specially conserved and their grains planted in experimental plots. By such

processes of careful selection very early maturing wheats had been evolved, and he commended the plan to the local farmers in the Avon Valley district. He thought a speciality should be made of early wheat, just as in the South and South-West attention might be directed to the later sorts. Referring to the stock question, Dr. Jameson expressed the hope that the new Agricultural Bank Act would stimulate stock production by farmers. He pointed out the facilities the district offered for grazing, judging by the good class of stock on exhibit, and pointed out the advantage that would accrue, not only to the farmer, but also the consumer, by encouraging small men to rear sheep."

W.A. PRODUCERS' CO-OPERATIVE UNION, LIMITED.

A meeting of the Western Australian Producers' Co-operative Union, Limited, was held at the Department of Agriculture, in the West Australian Buildings, on the 7th inst. Mr. Charles Harper, M.L.A., presided.

The Chairman explained that the object of the Union was to protect the interests of all classes of producers by mutual co-operation. It was not expected that the Union would be fully formed in a short space of time. It was more desirable that it should grow with the needs of the producers, so that as markets were required for the products they should be exploited and opened up by the Union for the benefit of the members. The amount of support that had been received was considerable, and was sufficient to enable the Union to commence operations. Its first object would be the protection of producers regarding the quality of fertilisers supplied, and to ensure this the Union was prepared to take orders for various manures, which would be supplied at the lowest possible rates; and in addition to the ordinary guarantees, the Union would undertake to check these guarantees by analysis on the arrival of the fertilisers in the State. It was also intended, as the requirements of the members developed, to enlarge the sphere of operations, and to undertake the disposal of produce, and the supply of all classes of producers' requirements.

A discussion followed on the subject of fertilisers. It was considered that the Union would be doing useful work if it saw that high-class fertilisers were introduced. It was stated that the question was being considered of opening branches of the Union at the various agricultural centres. As the support accorded to the Union in each district increased the greater would be the probability of a branch being speedily opened in that district. Those present expressed themselves as sanguine of the success of the Union.—*West Australian.*

WHAT CONSTITUTES A GOOD YEARLY BUTTER RECORD.

The following excellent article was contributed by Mr. J. A. Danks at the annual meeting of the Western Guernsey Breeders' Association, held in Madison, Wis., in 1901. It defines many valuable ideas and standards of judgment which the average dairy farmer is somewhat in need of:—

"The amount of butter which a dairy cow will produce in one year under the same conditions varies considerably, and is not affected as much by the breed as by the individuality of the animal.

"The conditions under which she is kept; the period of lactation; the amount and quality of feed given, and numerous other things, affect the yearly butter records of any and all cows.

"In comparing the records of different cows the cost of feed should always be taken into consideration. This is an item that, with the average dairyman, is seldom taken into account. As the cost of feed consumed by a dairy cow will vary between £4 and £10, the importance of considering this item will at once be apparent, especially if it be considered from a financial standpoint.

"For instance, a cow produces 400 pounds butter in one year, and she consumes £10 worth of feed; estimating the butter to be worth one shilling per pound, this gives you a gross income of £16; minus the £10 cost of feed, and we have a net profit of £6. Supposing another cow produces 300 pounds of butter and only consumes £5 worth of feed. We have a gross income of £12, or a net profit of £7, which is £1 more than the cow which produced 100 more butter, which, with a herd of 20 or 30 cows, would amount to quite an item. These are figures which are duplicated every year on a number of dairy farms. I think that the stockmen throughout the country are realising more fully each year the importance of a yearly record, and the insignificance of a weekly record.

"Although there is a certain relation between a cow's weekly record and her yearly record, the relation is not so clearly defined as most dairymen imagine. In fact the cows at the Wisconsin Experiment Station which have been tested for one week, have invariably shown that those having the best yearly records have the smallest weekly records, and those making the largest weekly records have produced the lowest yearly yields of butter.

"I think that a weekly record should be considered as representing the maximum yield of the cow under the best of conditions, unless you are acquainted with the circumstances and know them to be otherwise. In buying a cow, I would attach very little importance to the weekly record if she had one, unless it was made when the cow was well advanced in the period of lactation, say two or

three months. To illustrate this I will explain an incident which came under my observation at the Wisconsin Experiment Station.

"One of our grade Guernsey cows is of a beefy type, and puts on flesh rapidly when dry, and will even get into a very smooth condition while milking, unless due care is exercised in regard to the quantity and quality of the grain given her. This cow produced for the year ending August 1st, 1899, 1,962 pounds milk containing 97·6 pounds of fat, or 113 pounds butter. The year following she calved November 1st, and for the week ending the 20th of same month made 18·48 pounds of butter, which is the best weekly record of any cow in the University Dairy herd, while in the year just mentioned she gave by far the smallest yield of butter of any cow in the herd. It is also interesting to note the decrease in yield of butter as she advanced in the period of lactation. She gave during the first eight weeks, after being fresh, 1,666 pounds of milk, which tested an average of 6·1, an equivalent of 118 pounds of butter, which is five pounds more than she gave the whole year previous. The second eight weeks she produced 1,410 pounds of milk which tested 5·1, or 79 pounds butter. The third eight weeks she gave 1,050 pounds of milk which tested 4·8, or 58 pounds butter. Her live weight at the beginning of the first eight weeks was 1,190; at the conclusion of the twenty-four weeks just mentioned it was 1,063, showing a loss of 127 pounds. Her grain feed at this time consisted of 280 pounds of wheat bran for the first period; for the second period 98 pounds of wheat bran and ground oats, and 49 pounds each of oil meal and corn meal. For the third period she received 112 pounds each of oats and bran, 56 each of oil meal and corn meal. This shows very plainly the folly of placing too much stress on a single week's or even a single year's test.

"It is usually the case that cows making phenomenal weekly records make them soon after calving, and lose rapidly in live weight during the test. On the other hand, out of ten cows in the same herd, whose records for a year vary between 405 pounds and 584 pounds of butter, only three have ever made over 14lbs. butter in one week. I do not wish to be understood as condemning the weekly test. On the contrary, I would recommend that every breeder and dairyman make weekly tests of his cows whenever possible. But it is important to bear in mind, as I have already stated, that they usually represent a cow's maximum yield under the most favourable conditions; although there are, of course, exceptions. I think the time will soon come, if it is not already here, when others besides the Guernsey breeders will realise the necessity and importance of a yearly record, not only of the milk and butter produce, but also of the feed consumed. Of course, in making a yearly record, there is always a tendency to feed a heavy grain ration, and the consequences are that a cow is often fed considerable more than she can digest without greatly overtaxing her system.

"It has been my good fortune to have been employed on two of the largest and most noted Guernsey farms in the United States,

and at these two places nothing was so marked as the different amounts of grain fed, not only to the cows from which it was wished to obtain a good yearly butter record, but to the whole herd in general.

"At one of these farms it was the practice to feed a heavy grain ration, several cows receiving 20 pounds each per day. One or two receiving as much as 28lbs. per day for several months in succession, and seldom receiving less than 15lbs. except when dry.

"The result was that the cows, although giving good yields of butter for a year or two, soon broke down under the heavy strain and would not pay for the food consumed.

"At the other farm this was entirely different, none of the cows receiving more than 10 or 12 pounds of grain per day. The amount of butter produced, even exceeded that of the herd first spoken of, while the stock was in a more healthy and vigorous condition. The fact that the owner now has in the herd a cow that is fifteen years old, and still in a good healthy condition, will confirm the statement. This cow has been kept in the herd for nine or ten years, and when eleven years old made 495 pounds of butter in one year, and has nearly, if not quite duplicated this several times since.

"This cow is Madame Bishop, 2724, and is owned by Mr. Hill of Rosendale, Wisconsin, who has seven daughters and six granddaughters of this cow now in his herd, and all promise to do even better than the old cow. One of her daughters was tested by the writer and gave in one week 20 pounds $10\frac{1}{2}$ ounces of butter, and has made 515 pounds butter in one year. Without doubt many of this herd of cows might, by heavy feeding, have produced at least 100 pounds more butter than their present records; yet I think that you will all agree with me when I say that the owner is now fully repaid for resisting the temptation to feed them a large amount of grain in order, if possible, to get even a greater yield of milk and butter, as Mr. Hill's herd now averages 495 pounds butter. No example which I might bring before you would better illustrate the evil effects of heavy grain feeding than the case just cited. It is the general conclusion of dairymen throughout the country, that if a cow is fed highly for a good record one year, the following she will usually give even less than her general average, but if fed only moderately she will often give a large amount three or four years in succession. The herd at the Experiment Station Farm is fed only a moderate allowance of grain, seldom exceeding 10 pounds per day, and the record of the herd in the Seventeenth Annual Report shows that nearly every cow exceeded the record made by her the previous year.

"This is due in part, perhaps, to the fact that they were not accustomed to their surroundings and conditions the first year, having been purchased only a short time before commencing the year's work. A number of them are already making a good showing, and indicate that they will exceed even their last year's record. In my opinion, it is the average high record of the herd and its general

improvement, year after year, rather than any phenomenal records that are produced by a few individuals, that shows the advance and improvement, not only of the herd, but of the breed in general, or, in other words, it is the amount of butter that a cow is able to produce year after year that should determine her value, rather than any high record that she may produce by heavy feeding in a single year.

"The sampling and testing of milk to obtain the yearly record is often a source of error with the average dairyman. This is not due so much to ignorance as to carelessness. Composite samples should be taken of the milk for not less than three consecutive days at least once each month. It is also very important that they be taken at the same time and near the middle of each month. These samples should be thoroughly mixed by pouring from one vessel to another, before taking the test sample. With a little care and judgment, the amount of butter produced by a cow for one year, can be gotten very accurately by this method. Of course, in making weekly tests, a separate sample should be taken at each milking.

"If the sampling and testing is not done properly, the results thus obtained will be worse than useless, as they will mislead not only the owner himself but all others who are interested in the welfare of the herd."

EGG-LAYING COMPETITION.

A number of poultry breeders in this State have been waiting the result of the Egg-laying Competition, which has been just concluded at the Hawkesbury Agricultural College, in New South Wales. For their information, and as a matter of interest to all who keep fowls, we publish a report of the trial, taken from our own Eastern exchange. It will be seen that the first prize fell to a pen of "Imperials," evidently a new breed, particulars of which we hope to give in a future issue. The report is as follows:—

"The six months' test in connection with the *Daily Telegraph* Laying Competition, which was conducted at Hawkesbury Agricultural College by Mr. D. S. Thompson, the Government Poultry Expert, closed on 11th October. The details afford many valuable comparisons. The competition has altogether exceeded the expectations of the promoters in exercising a widespread influence in stimulating the breeding of higher standard egg-producing fowls. Even the majority of the competitors, who are among the most experienced poultrykeepers in the State, have learned much from it. Three members of the committee, Messrs. W. Harris, H. E. Kelly, and the *Daily Telegraph* representative, visited the college on the final day and checked the records. The following are the prize-winners:—Greatest number of eggs: M. Ward, first,

£10; A. E. Henry, second, £5; Grantham Poultry Farm, third, £4; G. Kennedy, fourth, £3; Bosanquet Bros., fifth, £2; W. H. Tombs, sixth, £1. Aggregate weight of eggs: M. Ward, first, £3; A. E. Henry, second, £2; W. H. Tombs, third, £1. The proprietor of the *Australian Hen* offered that journal for a year to the owners of the pens that averaged 70 eggs each per bird. The first eleven competitors secured the necessary number. The average results of the various breeds were:—

6 Imperials	... ...	426	eggs,	averaging	71·00
24 Silver Wyandottes	...	1,681	,,	,,	70·04
48 Black Orpingtons	...	3,127	,,	,,	65·14
30 Buff Orpingtons	...	1,949	,,	,,	64·90
18 Buff Wyandottes	...	1,145	,,	,,	63·61
30 White Leghorns	...	1,746	,,	,,	58·50
12 Anconas ...	... ...	672	,,	,,	56·00
6 Golden Wyandottes	...	317	,,	,,	52·83
6 "Birrilees"	... ...	317	,,	,,	52·83
18 White Wyandottes	...	848	,,	,,	47·11
6 White Orpingtons	...	273	,,	,,	45·50
12 Buff Leghorns ...	...	493	,,	,,	41·08
12 Andalusians	... ...	464	,,	,,	38·66
18 Minorcas	... ...	589	,,	,,	32·72
246 Hens totalled	... ...	14,047	,,	,,	57·10

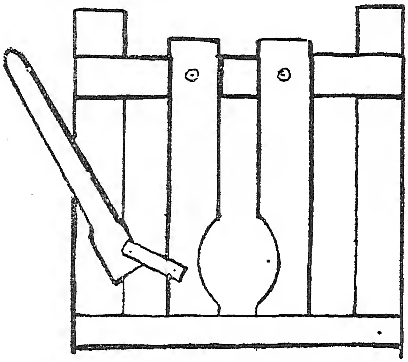
The monthly laying was:—April, 756 eggs; May, 1,090; June, 1,630; July, 2,839; August, 3,346; September, 4,386: grand total, 10,047. Total weight, 1,856½lbs. Mr. Thompson reports that the broodies gave great trouble during the month. In a retrospect he says:—The competition has been the largest of its kind ever conducted in any part of the world. The interest taken in the competition has been world-wide, and it has opened the minds of conservative people to the importance of the poultry industry, and will lead to more consideration being given to the egg-producing branch than it has received in the past from the Government and the people. The laying right through has been regarded by competent critics as excellent. Of course, the number of pens run by us has been much more numerous than in any other competition in the world, and consequently our gross average laying would be less, but in comparison with any other competition, taking an equal number of pens, we do not suffer. On the contrary, taking our first 20 pens, and comparing them with the 20 pens run in the latest English competition, we come out considerably to the good, while our first and second pens beat their first and second pens in averages for a corresponding period. The quantity of food served to each pen consisted of one pint of bran and pollard mash in the morning, mixed with liver soup; green food at mid-day; and one pint of grain at night. The feed cost on the average 1d. per pen per day for the staple foods, besides the meat and shell grit, which we give in the total. The cost for the six months has been:—Staple foods (grain, bran, and pollard), £31 17s.; meat, £2 12s.; shell grit, 7s. 6d.: total, £34 16s. 6d. The market value of the eggs laid was £83 13s. 11d., thus showing a profit of £48 17s. 5d. for the six months. The average value of the eggs was 6s. 5d. per hen, and the cost of feeding 2s. 9d., leaving a profit of 3s. 8d. each. Mr.

Ward's black orpingtons thus gave a profit of 9s. 1d. Only one pen failed to pay for its feed. All the pens but those of Mrs. Burke, E. Clifford, J. Hunt, and H. Cadell have been re-entered for the second six months. The appended table gives full details of the laying and the value of the eggs from each pen of six birds. The value has been calculated on the basis of the eggs laid each week and the prices obtained for best new-laid eggs at the auction sales in Sydney each Friday.

Owner and Breed.	Eggs Laid.							
	April.	May.	June.	July.	August.	September.	Total.	Market values.
M. Ward, Black Orpingtons	24	82	85	124	118	115	548	71/-
A. E. Henry, Silver Wyandottes ...	31	74	101	106	100	107	519	68/9
Grantham P.F., White Leghorns ...	58	69	49	56	102	136	470	61/1
G. Kennedy, White Leghorns	45	36	60	100	107	121	469	58/-
Bosanquet Bros., Buff Orpingtons ...	58	44	52	108	98	91	451	58/3
W. H. Tombs, Anconas	18	66	80	72	105	103	444	57/4
J. F. Brown, Silver Wyandottes ...	31	59	66	82	104	101	443	57/1
E. Waldron, Black Orpingtons ...	17	67	66	81	97	114	442	57/1
Mrs. G. D. Cheshire, Black Orpingtons	29	36	69	117	99	81	431	56/5
Mrs. H. Bastin, Black Orpingtons ...	32	30	85	105	50	128	430	54/6
W. E. Boutcher, Imperials	27	84	49	74	116	76	426	57/2
J. E. Pemell, Buff Wyandottes ...	25	38	51	78	107	119	418	49/9
F. Greenwell, Buff Orpingtons ...	27	38	49	102	90	108	414	51/1
J. J. Roche, Black Orpingtons ...	2	23	59	110	103	111	408	48/3
E. Clifford, Buff Wyandottes	27	33	51	81	106	97	395	48/-
H. J. Braithwaite, Silver Wyandottes	60	53	87	75	53	66	394	45/1
Maxwell & Neate, Black Orpingtons ...	17	42	88	67	81	99	394	40/6
J. D. Callaghan, Buff Orpingtons ...	41	5	40	80	110	106	382	44/2
Chatswood P.F., White Wyandottes ...	44	52	44	56	80	101	377	48/9
James Hunt, Silver Wyandottes ...	...	4	51	94	106	119	374	42/9
W. H. Peters, Buff Wyandottes ...	1	...	22	94	107	108	332	35/9
H. E. Kelly, Buff Orpingtons	14	13	53	99	64	85	328	39/9
John Young, Silver Wyandottes ...	9	12	35	79	84	106	325	37/-
A. Hallen, Golden Wyandottes ...	12	...	38	53	100	114	317	35/8
D. Scott, Birrilees	...	18	34	54	81	130	317	34/5
A. Munro, Buff Leghorns	17	18	26	67	80	98	306	35/6
W. Haydon, White Leghorns	7	17	22	83	70	94	293	33/6
C. K. Horwood, White Leghorns ...	11	20	23	47	71	112	284	31/6
W. F. Evendon, Andalusians	1	...	21	66	68	122	278	29/-
S. G. Small, White Orpingtons ...	2	2	19	61	73	116	273	28/9
W. B. Bull, White Wyandottes ...	21	10	3	56	52	129	271	29/4
Dr. Fiaschi, Black Orpingtons ...	...	...	...	71	68	119	258	25/8
Mrs. A. Hislop, White Leghorns ...	3	...	...	3	103	121	230	21/-
G. Hemsley, Anconas	1	1	13	28	83	102	228	22/8
H. Cadell, Minorcas	1	1	4	56	37	127	226	22/7
W. C. Freeman, Minorcas	1	6	21	47	24	104	203	21/1
L. L. Ramsay, Black Orpingtons ...	18	8	5	47	61	77	216	24/-
W. Harris, White Wyandottes ...	16	3	...	20	54	107	200	19/9
Mrs. T. Milsop, Buff Leghorns ...	8	21	1	6	71	80	187	19/6
Mrs. J. Burke, Andalusians	...	...	7	30	30	119	186	18/-
E. J. Winton, Minorcas	...	5	1	4	33	117	160	14/6

A PIG RING GATE.

An easily-made gate or chute for the purpose of ringing pigs is that presented in the accompanying diagram. The two centre boards swing free on pivots attached to the crosspiece, with the exception of that to which the lever is attached. The work of ringing the animals is facilitated by the construction of a drive of hurdles or any other obstructions narrowing down to the gate. Any port in a storm is the adage of the pig when in a quandary, and into the inviting opening, though limited may be its extent, will go the head of the animal, but that is all. Down comes the lever, and piggy is fast. Then the operation which elicits such piercing protests follows without trouble to the operator. With such a device properly constructed, the largest hog can be held with ease.—*Farmer and Grazier.*



SHEEP ON THE FARM.

Wool has almost ceased to be a factor in the sheep industry, as farmers have discovered that there is more money in selling early lambs and fat weathers than to depend solely upon wool as a source of profit from sheep. The fleece is simply a by-product, and no progressive farmer now expects to make sheep pay with the wool as the principal source of revenue from the flock. The majority of farmers do not have large flocks, twenty-five sheep being considered as above the average, and they are kept largely because they are of valuable assistance on the farm in consuming weeds and other waste materials that possess no value. It is well known that a flock of sheep will clear a field of weeds rapidly, and they will also keep the pests down. While so doing they distribute manure evenly on the

ground and press it into the soil with their feet. For these advantages from sheep there are farmers who would not be without them, as they save labour and demand but little attention. It has been frequently demonstrated that from fields upon which large flocks of sheep have been hurdled the yields of grain have been doubled, due to the fertility added to the soil by the sheep. Farmers who give their attention to early lambs and the production of choice mutton have found Southdown rams excellent for the improvement of the common flocks, as the Southdown is hardy, and such sheep can be kept in larger flocks than the Oxfords or Shropshires, though the latter breeds are larger in size than the Southdown. The preference for the Southdown is also due to the fact that the grades are excellent foragers and can subsist on scanty herbage compared with some other breeds or crosses. Wherever cattle are kept sheep can find also a place, as the sheep will clean up lands upon which the cattle may leave much that could be turned into profit. No farmer, however, can expect the best results from sheep without care; but sheep require less attention than other animals on the farm.

ANSWERS TO CORRESPONDENTS.

Mr. H. Reading, Newtown, writes.—"Cattle in this part of the Sussex district are very liable to that fatal disease—enlargement of the gall. I should esteem it a favour if you could inform me of a preventative; I have just lost a very valuable Jersey cow from it." The matter being referred to the Government Veterinary Surgeon, Mr. Weir reports:—"In reply to correspondence, numbered 104-585, requesting information *re* disease in cattle at Newtown. Enlargement of the gall bladder usually follows impaction of Rumen which blocks the free flow of bile into the small intestine. In the later stages of this disease medicinal treatment is of no practical use, an operation by means of cutting into the Rumen and removing two-thirds of the contents is the only means by which relief can be given. An aperient should be given in the early stage, such as: Sulphate of magnesia, 1½lb., common salt, 1½lb.; treacle, 1½lb.; ginger 2oz. Dissolve in hot water and administer in the form of a drench. On the following day give stimulants, whiskey two wine glassfuls, in the form of toddy every four hours until the medicine has operated. The food for some time after should be light and easily digested."

A correspondent writes:—"I am requested by one of the farmers here to write and ask you if you have any remedy for destroying grubs or caterpillars. They are doing a lot of injury to the gardens, especially the onion crop. They come up out of the ground at night and eat off the tops of the onions." The matter being referred to the Chief Inspector, Mr. Buchanan replies:—"The grubs complained of are evidently of the cut-worm tribe, and can easily be poisoned with bait composed of Paris green

and bran. To prepare the bait, take 10lbs. of bran and 4ozs. of Paris green. Moisten the bran and dust the Paris green over it, stirring the mass up and adding the poison until each particle of bran becomes tinged with green. The addition of a little sugar or molasses will make the mixture more acceptable to the grubs. The bait should be sprinkled lightly along the rows of plants, or if a large area has to be dealt with it can be lightly broadcasted. As Paris green has a burning effect on vegetation it should not be sprinkled over broad-leaved plants, which would catch and hold it."

Mr. O. Schwanitz, Cranbrook, writes:—"As the season for grasshoppers is here again, let me tell you of a fly which kills them. The fly is about five-eighths of an inch in length, dark grey or black, very active, nearly or quite the same thickness the full length of its body, and little if anything thicker than a safety match. When sitting on the grasshopper she would escape the notice of most observers, as there is an entire absence of any struggle. The laborious walk of the grasshopper and depth of body caused me to look at them. After riding for a few feet, the fly left the grasshopper, took a few circles in the air, and again returned on his back. This she repeated. I made an attempt to catch her alive. She once sat on my hand, but ever on the move, caused me to lose her. On going to the hiding-place of the grasshopper about five minutes later, I found him dead. P.S.—This is from last year, and later in the season." The matter being referred to the Horticultural and Viticultural Expert, Mr. Despiessis replies:—"Last month's issue of the *Journal* of the Department gives a telling description of the ravages of the plague locust on the Upper Murchison, and as the season is now at hand when grasshoppers and locusts are on the wing, observations such as the one contained in this letter will help in giving us some information regarding locust parasites. Of these, two are described from New South Wales: a hymenopterous or four-winged fly, whose lavæ is parasitic on the eggs of the locust and grasshopper, and a dipterous one, the Tachina Fly (*Masicera pachytyli skuse*), which attacks the locust itself, into which it lays one or more eggs, the grubs living within the locust, avoiding the vital parts with unfailing instinct and coming out when they are full grown. This exit of the parasitic grub is soon followed by the death of the grasshopper, which in the meantime has been growing feebler and feebler. On escaping the grubs bury themselves in the surface of the earth, where they change to the pupal state, and a few days later emerge as flies which are not quite a quarter of an inch long and are of a yellowish-white colour. The fly described by the correspondent is evidently neither one nor the other of these two sorts. It may be one of the mud wasps or ichneumon flies, such as those which hunt for cutworm grubs, and terrier-like, unearth them. The prompt death of the grasshopper would tend to show that it had been attacked by one of these carnivorous wasps, which first numb their victims and then carry them home. I would be glad to receive during the summer months grasshoppers supposed to have been attacked by parasites, as well also as any suspected parasite. A gauze bag fixed on a hoop and set on a stick, butterfly-net fashion, would prove an expeditious way of catching them."

GARDEN NOTES FOR DECEMBER.

By Percy G. Wicken.

Although the summer has, so far, kept exceptionally cool and the season is rather late, by the time these notes appear in print we must expect to have the dry weather at hand. The late rains which fell during October will be of great assistance to our orchardists, as they came at a time when they will be of great benefit to the young fruit which will just be filling out. Those who have taken steps to irrigate their land will now begin to realise that their money is well spent, but it must not be supposed that irrigation is a remedy for all evils; much has to be done by constant cultivation to conserve what moisture we have in the soil, and also by drainage; in fact, in many cases, more harm than good is done by irrigating crops. Unless the soil is well drained to enable the surplus moisture to get away, the water becomes stagnant and causes the soil to become cold or sour, and the crops do not flourish; plants do not like stagnant water; it must be kept moving to derive the greatest advantage from its use.

Land which has been swampy during the winter will now be available for growing vegetables, maize, sorghum, and other crops for green feed for stock. Some very good yields are obtained from this land by following the water as it recedes and planting out in the moist ground. The hoe should be kept going and the weeds cut down as soon as they appear, as this allows the crop to utilise all the moisture in the soil.

Beans (French or Kidney).—Plentiful supplies of this vegetable should now be to hand; there are many varieties, both dwarf and runners, and a continuous supply can be obtained, with ordinary attention, all through the summer. A little superphosphate or sulphate of potash manure should be sown with the seed or used as a top dressing. The pods should be picked when young, as this causes the plant to yield a greater supply than if left to mature.

Beans (Lima) may still be planted; those sown early in the season will now be making good growth; they are an excellent vegetable, and should be grown in every garden.

Cabbages can be planted out from the seed bed, but will require to be shaded from the sun for a few days, until the roots get established in the soil. Seeds may be planted in beds for future use. If aphis are troublesome, spray with tobacco wash, and if grubs are eating the leaves spray with Paris green 1oz. to 10 gallons of water; make the Paris green into a paste first, and then add the water and stir well.

Cucumbers will now be plentiful; in moist places a few more seeds may be sown, but in dry land they will require watering.

Celery.—If a liberal supply of water is available, a few more plants may be put out, and a little seed for future use sown. In

planting out young plants it is best to put in a trench and hill up as they grow.

Maize.—This plant, as a vegetable, does not receive the attention it deserves. In America it is very largely used, and we import a quantity of tinned maize into this State which might be all grown in the State with profit to the grower. Table maize is not the same variety as is grown for fodder purposes; it is a dwarf variety, and matures early. Stowell's evergreen and Henderson's sweet maize are both good varieties.

Melons (Rock, Water, and Preserving).—Early rock melons should now be in the market, and water melons will soon follow. It is now late for sowing further supplies of these varieties, but a few preserving melons may still be sown with hope of success.

Pumpkins.—Early varieties will now be in bearing. Bush marrows and custard squashes are now ready for sale; a few of the late varieties, such as the Bugle pumpkin, may be sown.

Sweet Potatoes.—If any more slips are available, they may be used to fill up any misses in the field; if there are no slips in the seed bed, cuttings may be taken from any of the earlier-sown vines that have started to run.

Tomatoes.—Early plants should now be bearing fruit. All plants should either be trellised or tied to stakes. Any plants available may be planted out, and a little seed put in for later crops. Supplies of this vegetable can be kept up almost all the year round.

Turnips.—Early varieties may be planted at the end of the month if sufficient moisture is available to germinate the seed.

Farm.—In the Northern districts harvesting operations will be almost completed. In the Eastern districts the hay is almost all cut, and the grain harvest in full swing; while in the Great Southern district harvesting operations and haymaking will be the order of the day. In spite of the dry winter, the average of the crops promises to be very fair, and Western Australia will still uphold her reputation for never having had a really bad season in which the crops have failed. Fire being one of the principal enemies we have to fear at this time of the year, all precautions should be taken to guard against loss, both by insurance and by taking all precautions against fire; a fire-break should be ploughed round all haystacks as soon as erected. Those who have an abundant supply of green feed should turn their attention to the making of ensilage, and thereby secure a supply of food for their stock; for, when the grass is dried up at the end of the summer, it will be found very acceptable. If no better means are available, a big pit, scooped out of the ground, is sufficient, and the earth thrown back on top of the green stuff to exclude the air; or a stack may be made above ground and weighted with fencing material, or any other dead weight which is available. If the surface soil is not too dry, sorghum, soy beans, and French millet can still be sown for green feed, and cow peas for seed.

THE CLIMATE OF WESTERN AUSTRALIA DURING OCTOBER, 1902.

On the whole, the climate was fairly normal. In the neighbourhood of Perth the barometer was above and the temperature below the mean for previous years, and the rain, though frequent, was light, the total being considerably subnormal. From the neighbourhood of Coolgardie down to the South coast the fall was unusually heavy. Elsewhere it was about the same as the average for previous years. One noteworthy storm occurred on the 19th, on the Coolgardie goldfields. On the 18th, there very few indications of its occurrence, the weather being mostly fine and clear throughout the State. There was, however, a very moderate "low" inland over the North Murchison district. During the day this developed considerably and moved southward, the barometer at Kalgoorlie falling from 30·04 to 29·69 during the 24 hours, and the weather became cloudy and unsettled throughout the Southern half of the State, with heavy thunderstorms in places. The depression then continued to move South or South-East, passing Eucla on the morning of the 20th, where the barometer fell to 29·57. As showing the partial nature of the rainfall, it may be mentioned that at the Coolgardie P.O. the gauge showed 253 points, whereas at the water supply gauge, only 400 yards distant, a fall of 368 points was recorded.

The hot weather has fairly arrived in the tropics, especially inland, where the mean maximum for the month was 98·4 at Marble Bar and 98·5 at Hall's Creek. The highest reading in the State was 109·5 at Derby, on the 29th. In South-West districts there were still occasional signs of a frost, the minimum temperature on the surface of the ground reaching 32 at Southern Cross, York, Karridale, and Katanning, the lowest recorded being 29·0 at Katanning.

The total rainfall for the year, so far, at the Perth Botanic Gardens has been 2,617 points, or 548 below the mean for the previous 26 years.

The Climate of Western Australia during October, 1902.

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					October, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	29·905	29·883	30·103	29·721	96·4	79·4	87·9	105·8	71·8	100·2	79·0	111·0	68·0	1	2168
Derby	29·938	29·913	30·099	29·736	98·0	71·0	84·5	109·5	65·8	96·6	72·6	112·2	60·0	Nil	1507
Broome ...	29·915	29·924	30·106	29·797	90·1	71·1	80·6	106·2	65·0	91·1	69·4	108·6	55·0	Nil	2222
Condon ...	29·982	29·914	30·165	29·797	91·4	57·8	74·6	104·8	51·0	92·5	62·7	108·2	49·0	Nil	2074
Cossack ...	29·982	29·934	30·177	29·804	91·2	64·5	77·8	103·0	...	91·9	68·8	110·5	54·0	Nil	1297
Onslow ...	30·010	29·992	30·176	29·819	90·1	60·4	75·2	104·2	53·0	89·5	59·2	113·0	48·0	Nil	441
Carnarvon ...	30·074	30·016	30·303	29·909	77·5	59·4	68·4	101·1	54·0	80·6	59·6	105·0	45·0	2	900
Hamelin Pool...	30·087	30·021	30·275	29·885	82·5	55·1	68·8	94·4	47·8	81·6	55·0	97·8	44·6	2	691
Geraldton ...	30·134	30·070	30·371	29·937	70·8	54·8	62·8	82·0	44·5	73·3	54·3	100·0	40·0	41	1419
INLAND:															
Hall's Creek ...	29·960	...	30·147	29·700	98·5	69·1	83·8	104·8	55·0	98·2	67·3	108·0	48·4	34	1491
Marble Bar ...	...	...	...	...	98·4	64·7	81·6	107·0	53·2	...	...	...	...	Nil	1202
Nullagine ...	29·962	29·923	30·246	29·725	93·7	57·5	75·6	103·0	44·0	96·2	61·9	107·0	45·0	Nil	1336
Peak Hill ...	30·008	29·956	30·321	29·713	84·8	56·9	70·8	94·0	41·5	86·5	60·3	97·6	47·2	Nil	1872
Wiluna ...	29·988	...	30·313	29·679	84·5	54·3	69·4	95·5	45·5	...	...	...	...	Nil	1331
Cue	30·070	29·992	30·386	29·790	83·7	54·2	69·0	94·8	47·8	83·2	55·2	99·0	41·5	10	894
Yalgoo ...	30·044	30·006	30·359	29·843	81·2	51·0	66·1	97·0	44·0	81·3	53·3	98·6	41·0	12	610
Lawlers ...	...	29·972	30·348	29·703	83·0	54·8	68·9	99·9	43·2	83·1	56·6	99·2	41·2	31	1164
Laverton ...	...	...	30·348	29·591	82·6	53·0	67·8	95·2	41·1	...	...	...	...	18	1138
Menzies ...	30·017	29·980	30·428	29·665	80·0	52·8	66·4	93·8	41·7	80·4	54·1	99·0	41·1	17	1097
Kalgoorlie ...	30·019	29·985	30·419	29·590	78·5	52·5	65·5	93·4	40·6	78·8	53·4	97·6	40·5	165	1088
Coolgardie ...	30·015	29·989	30·430	29·6 1	77·3	50·3	63·8	94·0	40·3	79·0	51·8	99·8	40·0	309	1356
Southern Cross	30·005	29·980	30·442	29·746	78·5	47·8	63·2	95·8	35·8	79·6	49·4	107·0	36·1	54	959
Walebing ...	...	...	...	...	73·8	45·2	59·5	91·0	33·8	...	...	...	...	39	1129
Northam ...	...	...	...	...	74·5	42·8	58·6	91·3	34·5	...	...	...	...	39	935
York	30·100	30·037	30·465	29·808	73·8	45·2	59·5	91·3	36·8	73·4	49·0	98·0	31·4	79	1066
Guildford ...	...	...	...	...	72·1	46·6	59·4	90·8	40·6	...	...	...	...	191	2367

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during October, 1902—*continued.*

Locality.	Barometer (corrected and reduced to sea level). Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. October, 1902. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	*Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens	30·116	30 060	30·183	29·884	70·6	50·8	60·7	85·8	43·7	72·8	52·4	97·0	38·0	147	2617
Perth Observatory	30·122	30·038	30·487	29·885	68·0	50·8	59·4	85·2	44·5	69·4	53·8	88·5	42·2	122	2673
Fremantle ...	30·146	30·042	30·478	29·918	65·2	53·1	69·2	75·5	47·0	68·7	54·2	96·0	40·0	90	2431
Rottnest ...	30·109	30·036	30·475	29·857	65·7	55·0	60·4	80·0	48·5	69·2	53·0	88·5	40·0	65	2194
Mandurah ...	...	...	...	...	68·2	46·5	57·4	81·8	36·0	...	...	...	...	83	2549
Wandering ...	...	...	...	...	69·4	38·6	54·0	85·0	33·8	...	...	...	...	175	1761
Collie	...	...	...	...	66·6	42·2	54·4	76·8	31·2	...	..	...	...	193	2692
Dardanup ...	...	...	...	...	66·6	43·8	55·2	74·3	36·7	...	...	...	...	147	2782
Bunbury ...	30·124	30·048	30·469	29·822	67 0	47·8	57·4	74·5	40·0	67·4	50·3	89·2	34·0	119	2431
Busselton ...	...	...	...	...	66·7	45·4	56 0	73·0	38·0	...	...	...	...	143	2383
Bridgetown ...	...	...	...	...	66·7	42·4	54·6	80·0	34·0	...	...	...	...	260	2908
Karridale ...	30·097	30·016	30·426	29·696	64·7	42·9	53·8	75·2	38·5	66·4	50·9	85·2	37·0	345	4380
Cape Leeuwin	30·072	29·971	30·438	29·519	64·3	54·5	59·4	71·2	51·8	64·6	55·3	82·8	45·4	215	3085
Katanning ...	30·083	29·962	30·391	29·772	68·3	44·1	56 2	83·2	34·0	70·1	45·7	92·0	31·0	137	1381
Albany ...	30·086	30·029	30·412	29·588	64·8	48·4	56·6	80·4	40·0	62·6	50·7	88·0	38·0	283	3922
Breaksea ...	30·075	29 973	30·403	29·537	62·0	52·0	57·0	74·2	45·0	62·4	52·3	78·0	39·0	241	2604
Esperance ...	30·050	30·022	30·388	29·770	67·7	51·9	59·8	82·5	42·2	69·1	50·9	110·0	36·2	574	2284
Balladonia ...	30·027	...	30·389	29·721	74·7	48·0	61·4	96·0	39·1	...	...	...	...	324	1230
Eyre	30·014	...	30·470	29·760	70·6	52·2	61·4	96·0	39·7	...	...	...	...	141	1388

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
8th October, 1902.

W. E. COOKE,
Government Astronomer.

RAINFALL for September, 1902 (completed as far as possible), and for October, 1902 (principally from Telegraphic Reports).

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points 100 = 1in.	October. No. of wet days.
East Kimberley:				
Wyndham ...	Nil	...	1	1
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	2	1	43	2
Plympton, St. Mary	...	...	...	...
Koojubrin ...	Nil	...	...	...
Hall's Creek ...	2	1	32	4
Flora Valley ...	...	...	...	...
Ruby Creek ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	Nil	...	...	...
Mt. Anderson ...	Nil	...	...	...
Leopold Downs...	80	1	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	Nil	...	5	1
North-West:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
De Grey River ...	Nil	...	...	...
Port Hedland ...	3	1	Nil	...
Boodarie ...	7	1	...	...
Yule River ...	...	...	...	...
Warralong ...	Nil	...	...	...
Muccan	Nil	...	...	...
Ettrick	Nil	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Pilbarra	Nil	...	Nil	...
Coongon	...	...	...	...

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
North-West—*cont.*				
Warrawagine ...	Nil	...	...	...
Braeside... ...	...	...	...	...
Bamboo Creek ...	Nil	...	Nil	...
Marble Bar ...	Nil	...	Nil	...
Warrawoona ...	Nil	...	Nil	...
Corunna Downs...	...	...	...	...
Nullagine ...	Nil	...	Nil	...
Yandicoogina ...	...	...	...	...
Tambourah ...	...	...	...	...
Kerdiadary ...	Nil	...	...	...
Roy Hill... ...	Nil	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	Nil	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	Nil	...	...	...
Tambrey ...	...	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	Nil	...	Nil	...
Cooyapooya ...	Nil	...	...	...
Woodbrooke ...	...	...	...	...
Croydon ...	Nil	...	...	...
Balla Balla ...	6	1	Nil	...
Roebourne ...	1	1	Nil	...
Cossack	Nil	...	Nil	...
Fortescue ...	Nil	...	Nil	...
Mardie	Nil	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	Nil	...	...	...
Onslow	47	1	Nil	...
Peedamullah ...	Nil	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	Nil	...	...	...
Wogoola ...	Nil	...	...	...
Nanutarra ...	13	1	...	...
Yanrey	...	...	...	...
Point Cloates ...	91	6	...	...
Gascoyne:				
Winning Pool ...	8	1	Nil	...
Towara	...	...	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	...	...	...	...
Thomas Police St'n	...	...	...	...
Bangemall ...	Nil	...	...	...

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
Gascoyne—*contd.*				
Mt. Augustus ...	4	1	...	...
Minnie Creek ...	11	2	...	...
Gifford Creek ...	...	...	...	...
Yanyeareddy ...	Nil	...	...	...
Williambury ...	Nil	...	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	...	...	...	...
Boolathana ...	...	...	...	...
Carnarvon ..	91	4	2	1
Cooralya... ...	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	23	3	...	...
Clifton Downs ...	10	3	...	...
Dairy Creek ...	6	2	...	...
Mt. Clere ...	...	...	...	...
Errivilla... ...	...	...	...	...
Dirk Hartog Island	150	11	...	...
Sharks Bay ...	96	5	4	1
Kararang ...	...	...	...	...
Meedo	63	6	...	...
Tamala	207	7	...	...
Wooramel ...	153	6	Nil	...
Hamelin Pool ...	190	6	2	1
Byro	19	3	...	...
Yarra Yarra ...	6	2	...	...
Berringarra ...	Nil	...	...	...
Mt. Gould ...	14	2	...	...
Moorarie... ...	...	...	...	...
Wandary... ...	18	2	...	...
Peak Hill ...	22	2	Nil	...
Horseshoe ...	17	2	...	...
Abbotts	16	1	Nil	...
Belele	...	...	...	...
Mileura	19	3	...	...
Milly Milly ..	...	...	...	...
Manfred ...	...	...	...	...
New Forrest ...	102	5	...	...
Woogorong ...	32	4	...	...
Boolardy... ...	12	2	...	...
Billabalong ...	...	...	...	...
Wooleane ...	43	3	...	...
Murgoo	36	2	...	...
Meeka	32	3	...	...
Mt. Wittenoom ...	32	2	...	...
Nannine	22	3	10	1
Star of the East...	23	3	9	1
Annean	38	2	17	1
Tuckanarra ...	32	4	2	1

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
Gascoyne—*contd.*				
Coodardy ...	15	3	...	...
Cue	40	4	10	3
Day Dawn ...	10	2	9	1
Lake Austin ...	40	4	13	1
Lennonville ...	37	3	5	1
Mt. Magnet ...	56	2	Nil	...
Wurracoothara...	...	...	...	...
Challa	53	4	...	...
Youeragabbie ...	41	2	...	...
Murrum... ...	...	...	...	...
Burnerbinmah ...	58	4	...	...
Yalgoo	56	3	12	...
Gabyon	41	3	...	...
Wurarga ...	130	6	...	...
Barnong... ...	...	...	...	...
Gullewa... ...	111	4	15	2
South-West Division (Northern Part):				
Murchison House	274	12	...	...
Mt. View ...	196	8	54	2
Mumby	278	14	121	8
Yuin	...	...	...	...
Northampton ...	470	10	156	5
Mt. Erin ...	...	...	...	...
Oakabella ...	357	11	...	...
Narra Tarra ...	370	7	...	...
Tibradden ...	...	...	...	...
Sand Springs ...	...	...	...	...
Mullewa... ...	242	11	10	3
Kockatea ...	190	8	15	3
Bootenal ...	136	4	...	...
Geraldton ...	149	14	41	9
Greenough ...	298	11	50	2
Dongara ...	129	8	75	4
Dongara (Pearse)	141	10	70	7
Strawberry ...	...	...	...	...
Mingenew ...	258	12	24	7
Rothesay ...	...	...	...	...
Field's Find ...	39	3	...	...
Carnamah ...	200	10	16	3
Watheroo ...	179	9	...	...
Dandaragan ...	376	10	59	3
Moora	200	11	35	3
Yatheroo ...	331	12	109	5
Walebing ...	233	14	39	8
New Norcia ...	245	13	40	6

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	507	13	73	8
Belvoir	474	14	223	6
Mundaring ...	665	15	187	9
Guildford ...	517	15	191	11
Kalbyamba ...	529	17	170	11
Canning W't'r'w'ks	587	11	236	11
Perth Gardens ...	555	17	147	11
Perth Observatory	519	17	122	13
Subiaco	456	16	128	12
Claremont ...	527	15	117	7
Claremont (Richardson)	500	14	...	...
Fremantle ...	512	15	90	11
Rottnest	363	18	65	8
Armadale ...	429	13	204	11
Rockingham ...	438	13	179	8
Canning River ...	665	15	...	...
Jarrahdale ...	642	14	305	10
Mandurah ...	529	13	83	9
Pinjarra	537	14	168	8
Yarloop	560	16	159	11
Harvey	575	16	136	9
South-West, Central Part (Inland):				
Hatherley ...	163	11	59	5
Momberkine ...	200	9	89	5
Mouglin ...	182	11	47	3
Culham	259	12	...	...
Newcastle ...	213	14	92	6
Eumalga ...	240	13	94	6
Northam ...	196	12	39	3
Grass Valley ...	198	14	46	4
Meckering ...	145	9	99	8
Cunderdin ...	155	10	113	5
Jarragin... ...	...	...	82	7
Doongin	167	10	...	...
Cuttening ...	213	11	...	...
Whitehaven ...	226	9	...	...
Sunset Hills ...	260	12	101	8
Cobham	230	14	56	5
York	207	14	79	7
Beverley ...	282	12	135	6
Stock Hill ...	...	...	147	5
Sunning Hill ...	295	9	145	5
Wandering ...	363	18	175	7

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
South-West—*contd.*				
Pingelly ...	243	11	143	6
Marradong ...	539	15	151	7
Bannister ...	454	18	...	...
Narrogin ...	391	12	224	8
Wickepin ...	245	12	133	4
Gillimaning ...	310	13	...	...
Bunking ...	...	...	184	8
Bullock Hills ...	322	13	...	...
South-West Division (Southern Part):				
Bunbury ...	440	18	119	11
Collie	536	19	193	13
Salvation Army Settlement	592	17	...	...
Glen Mervyn ...	636	17	180	11
Dardanup ...	400	13	161	7
Donnybrook ...	449	18	147	8
Boyanup ...	345	16	141	8
Ferndale ...	544	17	...	...
Busselton ...	249	18	143	16
Lower Blackwood	739	18	307	13
Karridale ...	640	17	345	21
Cape Leeuwin ...	481	21	215	23
Biddellia ...	569	18	...	...
The Warren ...	854	20	358	15
Lake Muir ...	405	19	259	17
Mordalup ...	336	18	...	...
Deeside	394	15	292	15
Riverside ...	423	16	...	...
Balbarup ...	455	20	251	17
Wilgarup ...	476	19	283	19
Mandalup ...	533	19	...	...
Bridgetown ...	450	21	260	17
Greenbushes ...	445	19	189	13
Greenfield ...	470	14	...	
Glenorchy ...	254	12	...	...
Williams ...	399	15	68	6
Arthur	322	14	215	12
Darkan	363	...	...	...
Wagin	309	12	158	6
Glencoe ...	410	14	144	11
Dyliabing ...	325	12	124	10
Katanning ...	268	13	137	8
Kojonup ...	442	15	309	13
Broomehill ...	323	14	218	12
Sunnyside ...	310	15	182	12
Woodyarrup ...	298	16	160	13

RAINFALL—*continued.*

Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.	Stations.	September. No. of points. 100 = 1in.	September. No. of wet days.	October. No. of points. 100 = 1in.	October. No. of wet days.
South-West—*contd.*					Eastern—*contd.*				
Cranbrook ...	334	13	...	...	Burbanks P.O. ...	243	6	69	3
Blackwattle ...	289	9	...	...	Burbanks Birthday Gift	238	6	75	5
Mt. Barker ...	506	19	266	12	Woolubar ...	93	6	...	...
Kendenup ...	552	19	282	13	Widgiemooltha...	187	8	334	7
St. Werburgh's...	346	16	...	...	50-Mile Tank ...	310	8	126	5
Forest Hill ...	456	20	...	...	Waterdale ...	...	...	237	8
Denmark ...	628	16	284	9	Norseman ...	213	10	318	6
Grasmere ...	611	20	372	19	Bulla Bulling ...	274	6	250	5
Albany	538	19	283	14	Woolgangie ...	298	7	149	5
Point King ...	580	19	299	13	Boorabbin ...	176	7	100	5
Breaksea ...	324	17	261	17	Karalee	166	8	...	...
Pallinup ...	274	15	139	11	Yellowdine ...	93	5	54	4
Bremer Bay ...	298	17	234	12	Southern Cross...	93	8	54	4
Jarramongup ...	288	14	...	...	Mt. Jackson ...	58	3	54	4
Eastern Division:					Bodallin ...	104	4	...	...
Lake Way ...	31	4	*Nil*	...	Burracoppin ...	103	4	...	...
Mt. Sir Samuel ...	43	3	12	1	Kellerberrin ...	161	9	102	5
Lawlers	142	4	31	3	Mangowine ...	...	...	...	...
Leinster G.M. ...	...	...	...	...	Wattoning ...	...	...	...	...
Lake Darlôt ...	116	4	...	...					
Mt. Leonora ...	107	6	6	2	Eucla Division:				
Mt. Malcolm ...	62	4	...	...	Ravensthorpe ...	296	14	478	16
Mt. Morgans ...	75	4	*Nil*	...	Coconarup ...	233	16	...	...
Burtville ...	58	4	...	...	Hopetoun ...	469	16	330	16
Laverton ...	142	4	18	2	Fanny's Cove ...	357	12	...	...
Murrin Murrin...	56	5	25	3	Park Farm ...	293	14	...	...
The Granites ...	78	3	11	1	Esperance ...	265	16	574	17
Tampa	67	4	...	...	Gibson's Soak ...	246	12	...	...
Kookynie ...	61	4	...	...	30-Mile Condenser	235	9	...	...
Niagara	85	5	9	...	Swan Lagoon ...	201	15	...	...
Yerilla	63	3	55	3	Grass Patch ...	213	13	...	...
Edjudina ...	99	5	...	2	Myrup	298	13	561	18
Menzies	56	5	17	2	Lynburn ...	278	11	...	...
Mulline	184	4	16	...	Boyatup... ...	206	8	...	...
Wangine ...	...	...	...	4	Point Malcolm ...	162	9	615	15
Waverley ...	172	6	30	2	Israelite Bay ...	124	7	489	11
Goongarrie ...	90	5	6	4	Bulbinia ...	162	8	...	...
Mulwarrie ...	234	7	40	3	Frazer Range ...	...	...	...	...
Kurawa	106	5	33	...	Balladonia ...	115	7	324	8
Kurnalpi ...	92	6	147	5	Southern Hills ...	194	9	...	...
Bulong	93	7	154	4	Eyre	229	9	141	12
Kanowna ...	96	6	75	3	Madura ...	...	...	...	...
Kalgoorlie ...	119	6	165	4	Mundrabillia ...	...	...	...	...
Coolgardie ...	192	6	309	5	Eucla	128	8	114	4

The Observatory, Perth,
5th November, 1902.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during October, 1902.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	9617	8233	1384	1384	3720	...	2663	...	...	664	...	976	84	...	...	...	...	...	126
Albany	543	513	30	30	322	...	38	...	...	35	...	118	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Esperance ...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	10160	8746	1414	1414	4042	...	2701	...	...	699	...	1094	84	...	...	...	...	...	134

Department of Agriculture,
6th November, 1902.

Return of Fruit Trees and Plants imported into Western Australia during October, 1902.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.															
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	9	845	8	809	1	36	...	351	...	...	60	...	...	...	...	...	230	100	...	20	48	...	...
Albany ...	2	88	2	88	...	...	...	68	...	...	...	...	...	...	...	...	12	...	...	...	8	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	11	933	10	897	1	36	...	419	...	...	60	...	...	...	...	...	242	100	...	20	56	...	...

Department of Agriculture,
6th November, 1902.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

NOTES.

Calf Rearing.—After an elaborate system of experiments with milk substitutes for calves, and additions to skim milk, the *Journal of the Department of Agriculture and Technical Instruction for Ireland* writes that:—"One part of whole milk added to five parts of separated milk is the best and cheapest, as it certainly is the safest and most easily prepared." This is what we have advised ever since the third year of the introduction of the separator to Tasmania. We have a lively recollection of the condition of the calves at Christmas of the first season when the separator was used, having acted on the journalistic accounts of the excellence of separated milk in its sweet condition warm from the cows and separator; the next season we made a contract with an oatmeal factory for a supply for the season, giving a verbal pledge that the purchase should be used for calf feed only; equal quantities by weight of the oatmeal, wheatmeal, and linseed were carefully mixed and liberally added to the skim milk during the next season, with only doubtful results; the next season new milk was added in quantity, according to the age and condition of animals, and whether they were intended for milkers or beefers—this plan is followed to date.

Home-made Wine.—Professor H. E. Van Simon gives the following directions for preparing unfermented grape juice for home use, and which has been published in the American papers:—"Put the fresh clusters, after all bad berries are taken off, into a cider press with a coarse cloth next the cage and press out a part of the juice very lightly. As soon as it begins to get dark red the pressure should stop and all the juice so expressed be kept by itself and put on to heat. Test it by a thermometer, and when it reaches 175 deg. bottle it at once, without any sugar or other thing in it. If it is brought to the boiling point it will lose the delicate grape flavour and have a cooked taste. The bottles should be kept hot in boiling water and the corks, too, so there will be no lurking germs of ferment left. Their tops should be dipped in melted wax to make them still more secure from the air. The darker juice may be pressed out as long as any of consequence remains in the pulp, but this should be heated and bottled by itself. It will not have the mild flavour of that first extracted, but some may like it better, and I have found this to be the case occasionally. Grape juice made in this way needs no sugar or anything else at any time, nor any dilution when the bottles are opened. It is mild and entirely harmless. There is no beverage that is better for the sick or well. Every grape grower can have it at little cost. It is the essence of the grapes, without the bothersome and useless seeds and skins."

Testing Eggs for loss of Weight.—The following directions are issued by the West Virginia Experiment Station for finding the loss in weight of eggs during incubation:—After placing the eggs upon the trays ready for the incubator, set the trays upon a pair of scales reading to ounces and note the total weight of the eggs and trays. (The trays should be thoroughly dry.) After a few days weigh again. Subtract this from the first weight. This will give the actual loss in the weight of the eggs. *Example*: Suppose that you have 208 eggs on the trays; that the first weight with trays is 24 pounds 2 ounces, and that on the sixth day the weight is 25 pounds 6 ounces. Then the loss in weight is 12 ounces. Now look in the table for loss in weight of 100 eggs for six days. This is 10 ounces. Ten ounces multiplied by 2·08 gives 20·8 ounces, which is the calculated loss for 208 eggs for six days. Therefore the eggs have not been losing weight as rapidly as they should, and the eggs should be given more ventilation or the incubator should be removed to a drier location. (It is assumed that the eggs are kept uniformly at the proper temperature.) After the eggs have been tested for the infertile ones, weigh again and proceed as before. *Rules*: If the eggs have lost too much weight give more moisture or less ventilation, but in reducing ventilation great care should be used, as pure air in the egg chamber is absolutely necessary. If the eggs have not lost enough weight open the ventilators, or place the incubator in a drier place. The table shows normal loss in weight of 100 eggs in ounces for the first nineteen days of incubation:—

Days.	Loss in oz.	Days.	Loss in oz.
1	1·65	11	18·60
2	3·31	12	20·33
3	4·96	13	22·10
4	6·62	14	23·88
5	8·28	15	25·66
6	10·00	16	27·44
7	11·72	17	29·21
8	13·44	18	30·99
9	15·16	19	32·77
10	16·88		

The Duck for Farmers.—The frequently asked question, "What is the best duck for the farmer?" seems now to be a settled one. From personal experience, as well as from that of others, we think that the Peking stands in the lead. It surpasses the other strains in its laying qualities, commencing the latter part of January or February and furnishing an abundance of eggs until the summer days have come, frequently laying 100 eggs or over in the season. After the laying season is over, an abundance of the finest feathers may be produced from the flock without any injury to the ducks whatever, but on the contrary rendering them far more comfortable during the hot weather. In maturing there is none better than the Peking, and none as easily raised. If properly fed and cared for they mature quickly, and in from eight to ten weeks will

net the busy housewife a neat sum, provided they are of an early hatch and ready for the market when the prices are good. There is always a greater demand in our markets for the Peking than for any other strain, on account of their heavy weight, and also because the meat has a delicious flavour; and when dressed for the market they present an attractive appearance. The Peking will thrive almost as well away from water as near it; but it is all the better for them to have access to a little water, as it keeps them in better health. They do not give the farmer the trouble the common duck did in former times. Instead of being a nuisance, they greatly assist him by foraging--keeping busy from morning till night, feasting upon the insects which are only a detriment to the farmer. As in all other stock, the standard must be kept high, and the breeding pen should contain only the best birds, and only those from strains noted for their size, laying qualities, and rapid growth.—*Exchange.*

MILK FILTERS NOT PRACTICABLE.—A bulletin of the Cornell station says:—While milk drawn under ordinary conditions becomes polluted with varying amounts of dirt and dust, milk obtained even with the most careful precautions will contain some foreign matter, which is teeming with germ life. These impurities, consisting mostly of dirt and dust, dissolve readily in the warm milk, therefore, if the latter is not strained promptly, little if any of the filth can be strained out. It is then of the greatest importance to reduce the time that elapses between the drawing and straining of milk to a minimum; even then it has been found that about one-half of the impurities go into solution before the milk reaches the strainer. Attempts have been made to use strainers or filters that would filter out bacteria, and thus reduce the number of bacteria in milk, directly. For this purpose absorbent cotton, paper filters, cellulose, gravel or sand filters, porcelain filters, and many other devices have been tested and used with more or less success. In order to thoroughly understand the value of these filters in connection with dairying, it is well for the dairyman to know that the bacteria are many times smaller than the fat globules in milk. Bearing this fact in mind it is not difficult to understand that, as soon as we make use of a filter that is dense enough to prevent bacteria from penetrating, the fat globules will also be filtered out. A large number of experiments conducted at this station and elsewhere have proved the correctness of this statement. The fact that the use of filters capable of depriving milk of one of its most valuable constituents, namely fat, and that such a process of filtering is exceedingly slow, and therefore impracticable in dairying, demonstrates clearly the impossibility of purifying milk bacteriologically by means of any filter now on the market.

THE INSECTIVOROUS BIRDS OF WESTERN AUSTRALIA.

By Robert Hall.

PART V.

BIRDS INSECTIVOROUS AND GRAMINIVOROUS.

Emus serve the purpose of this part. There are thought to be two species in our State ; but it is still a question upon which naturalists are divided. However we look for an early settlement of the question. Graziers object to the bird more because it irritates and leads a few lambs to destruction than on account of the grass it eats. Just as the fruitgrower looks upon fungicides as a part of the working expenses of his orchard, so should the grazier depend upon the Emu to the same extent. It eats grasshoppers by the million per week, and specially at a time when the laying of eggs would place the insects upon a solid and dangerous footing. From the point of view of utility, the bird should be preserved. What does John Gould say? "I must content myself by praying that protection may be offered to that noble bird, the Emu. . . ," How much will the loss of this fine bird be regretted by every right-minded person who claims Australia as his fatherland. While we think of acclimatising animals, we hope for things we have not, and neglect those we have. It will grow scarce little by little as our timbered country opens, and for the sake of its beauty, unique form, and the something that belongs only to our continent, we should, one and all, see it undisturbed, and the law for its protection properly supported.

Emu.

Dromaeus novæ hollandiæ, Lath. (Dro-me'us, no-ve hol'an-di-e).

Dromaios, swift; *novæ hollandiæ*, of New Holland.

Dromaeus, novæ hollandiæ, Gould, "Birds of Australia," fol., vol. vi., pl. 1; "Key to Birds of Australia," Hall, p. 109 (1899).

Geographical Distribution—Throughout Australia.

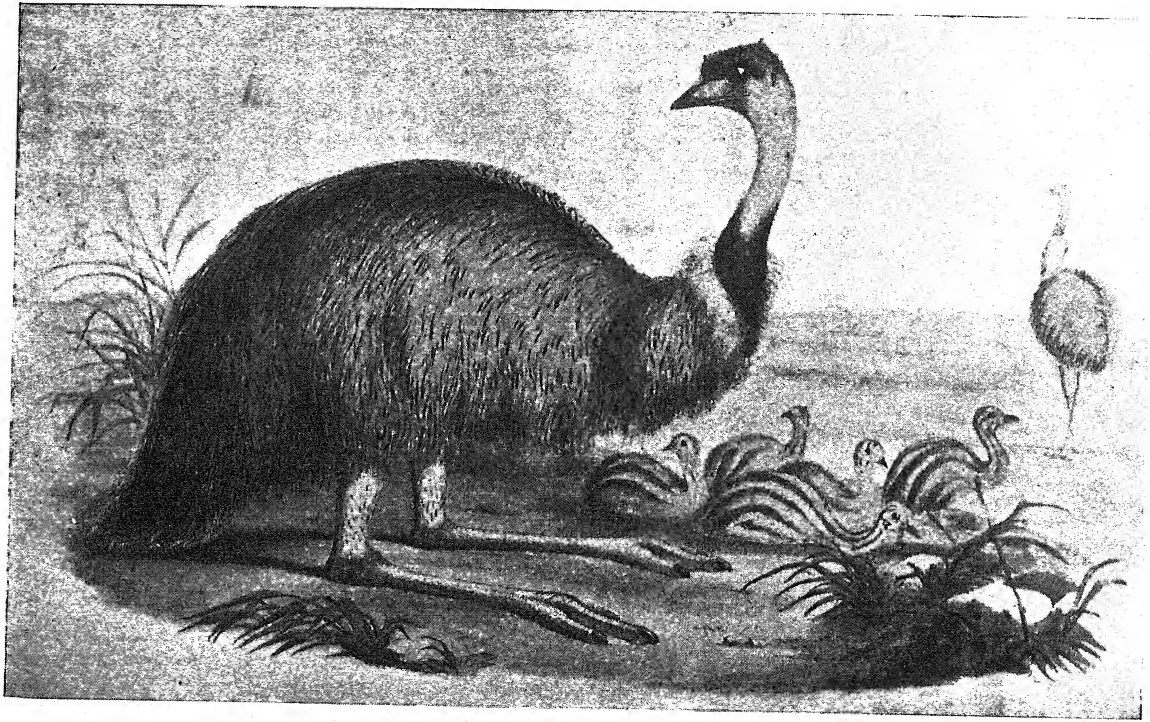
Key to the Species—

Adult.—Plumage uniform greyish, with tips of feathers black; *tarsi* have reticulated scutes in front, except near the toes, and behind rough scales; *hallux* absent. Total length, 78 inches.

Young.—The body is striped.

The Emu is one of the two Australian birds that never leaves the ground to fly or perch in trees. The second is the Cassowary, of North Queensland.

Their wings, like those of the Apteryx, of New Zealand, are living examples of what disuse will bring them to.



Emu and young.

INFERTILE GRAPE VINES.

By A. Despeissis.

Now that the vines have set their fruit, any that are sterile or fail to carry a crop commensurate with their vigour more forcibly attract attention.

This non-setting is the result of a variety of causes, and an understanding of what these causes may be enables one to alter conditions which bring them about and so apply the remedy. By setting of the fruit is understood the proper fertilisation of the ovary. This occurs in the spring of the year, and wherever grape vines are grown under artificial conditions of shelter, etc., it proves an anxious time to all cultivators of the vine.

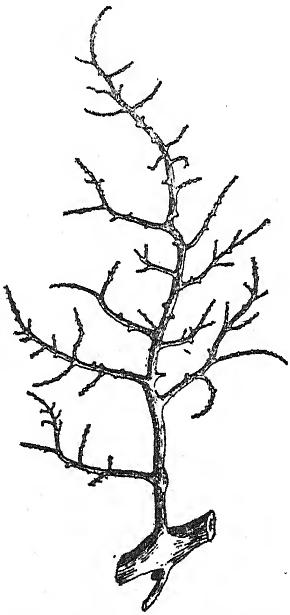


Fig. 1.—Bunch of grapes showing complete non-setting.

In Western Australia, where the open air climatic conditions in the spring are in every respect favourable to the proper fertilisation of the ovaries, grapes set without trouble and with great perfection. Yet individual exceptions are occasionally met with, which are subject to the following conditions :—

I. Climatic conditions which cause non-setting.

II. Structural or constitutional defects..

In the first instance it is important to understand how the grape vine blossoms set.

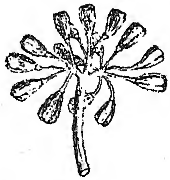
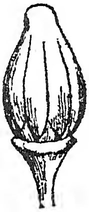


Fig. 2.—Normal buds before fertilisation.

Fig. 3.—Normal flowers after fertilisation.

Reference to the figs., some of which are taken from A. Bonnet's "*Selection as applied to the Vine*" illustrate the different possible occurrences.

Figs. 4, 5, and 6 illustrate on a magnified scale the structure of a normal grape vine flower and show the bud, then the peculiar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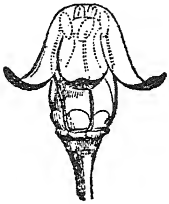
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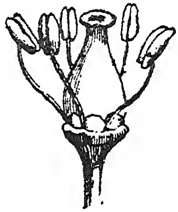
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Fig. 4.—A grape vine floral bud.

Fig. 5.—Same showing the petals of the corolla detached from the base and united above, pressing the anthers against the pistil.

Fig. 6.—Same with the corolla removed, and showing the antherę ready for excision.—(Foex.)

way the petals unfold from the base of the calyx. This dislodgement of the cap causes a jerk which scatters the pollen in the anther sacs on the stamens (Fig. 6). This pollen comes into contact with the stigma of the pistil which carries it to the ovary.

Free setting varieties have the stamens erect, forming a cluster round the inflated tip or stigma, a position which is found advantageous to the proper fertilisation of the ovary. These vines, which constitute the majority, are perfect hermaphrodites.

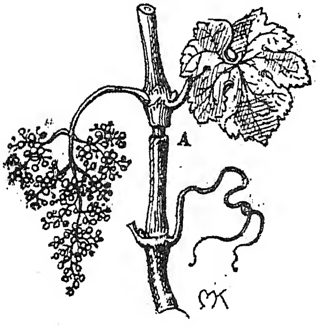


Fig 7.—Annular incision at A.


Fig. 7a.—Vine shoot pinched back.

Climatic conditions, it must be evident to all who have any experience of Western Australian climate, are there in every way favourable to the free setting of the grape vine blossoms. Even the muscat of Alexandria, that queen of all grapes, which is discarded in the Eastern States on accouut of its defective setting, fruits here to perfection. In the coastal districts, especially from the Murray Estuary as a Southern limit to the Murchison at the North, a badly set bunch is more the exception than the rule. The climatic conditions which are unfavourable to the free setting of grapes are in the main sudden and excessive changes in the temperature; persistent rain or drying land winds at the period the blossoms are opening.

When vines fail to set properly on that account, either pinching back of the fruitful shoots or ringbarking under the joint from which issues the bunch will, if practised a few days before the blossoming, cause it to set better. (*See* figures 7 and 7A.)

Constitutional defects very often cause bad setting.

The following figs. show at a glance in what respect some flowers show malformation :—

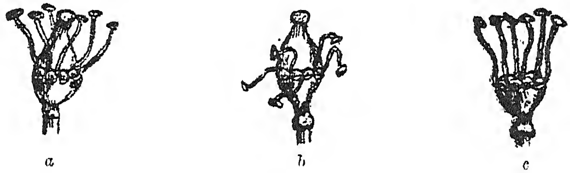
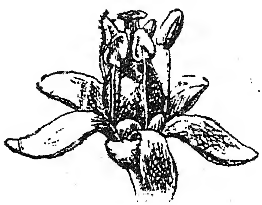


FIG. 8.—(*a.*) Perfect flower.
(*b.*) Reflexed stamens.
(*c.*) Staminate flower.

Whenever the stamens fall away from the pistil and are deflexed the act of pollination cannot very well take place and the bunch sets badly.

It sometimes happens that the pistil is altogether absent, and as this organ contains at its base the ovaries or germ of the future fruit, that absence means permanent sterility.



FIGS. 9 and 10.—Sterile flowers opening rose-like.

Other flowers are sterile owing to the peculiar way they expand. Instead of the petals unfolding from the base as shown in Fig. 5, they open rose-like from the top, and when they thus open there is no jerk and no scattering of pollen, and consequently bad setting; or it happens that the stamens remain stuck to the petals and are shorter than the pistil and are not able to reach up to the gummy secretion on the stigma.

The various floral organs, moreover, undergo at times modifications which prove obstacles to their fertilisation. Thus whole bunches are seen to turn into tendrils; or, owing to a thickening of any one of the floral organs the flower assumes the appearance of being double. Such flowers are always sterile.

Fig. 11.—Double flowers.

All these structural defects are hereditary and liable to be transmitted through cuttings, hence the importance of eliminating such vines from a vineyard by grafting on them scions from fertile vines, and also the advisability of rejecting any cutting from them for the purpose of planting. Other constitutional causes as well influence the bearing of vines and lead to imperfect setting.

The bunches are loose and contain berries of various sizes with numerous blanks between. A lowering of the vitality of the plant consequent upon attacks of oïdium, or other fungous diseases, predisposes vines to this form of bad setting.

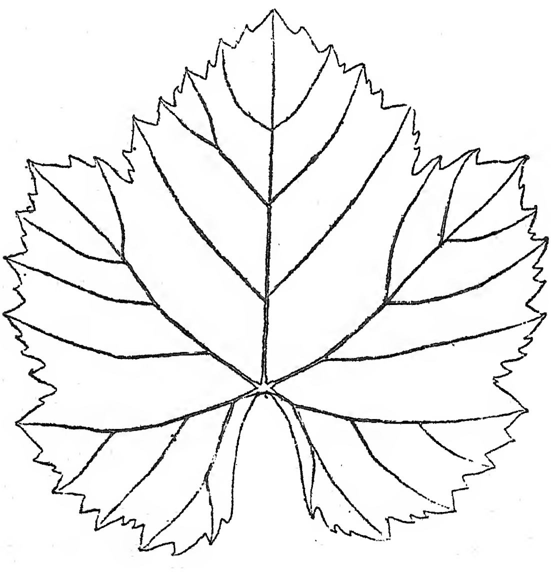
This accident may also be caused by a sudden drop in the temperature, by continuous rain at blossoming time, or by hot blasts of drying wind. Although a few berries which set properly grow to their full size, numerous small ones never grow very large, and are devoid of seeds. They ripen and are as sweet as the others. The *Black Morocco* grape is particularly subject to this form of bad setting or shanking. The explanation given of this peculiarity is that for one or other of the causes mentioned above, a few flowers only set and the others are blighted. A number of the more backward blossoms which generally fail to set when the first blossoms have turned into fruit then open and form fruit. These, however, located on the

same bunch alongside others which are growing rapidly, are checked, remain small and seedless.

Amongst the remedies suggested to counteract the effects of bad setting are:—Selection of cuttings from fertile vines, pinching back of shoots, ring-barking, sulphuring at blossoming time, and grafting on the sterile plants.

The shape of the leaves often furnish an indication regarding the fruitfulness of vines. In every vineyard may be noticed plants, often very vigorous, growing leaves which are comparatively more deeply indented than others on vines of the same variety. These plants are generally less fruitful than the others; they carry smaller and fewer bunches, or are not fruitful at all. They are known as "wild" vines by the growers. Being particularly luxuriant, cuttings are at times selected from these plants which, however, almost invariably transmit to the vines issuing from them the same characteristics of sterility and of excessively vigorous growth which were exhibited in the parent.

FIG. 12.—Bunch badly set.—(FOEX.)



The same characteristics are often seen on leaves growing on a sterile water shoot or sucker issuing from a vine stump.

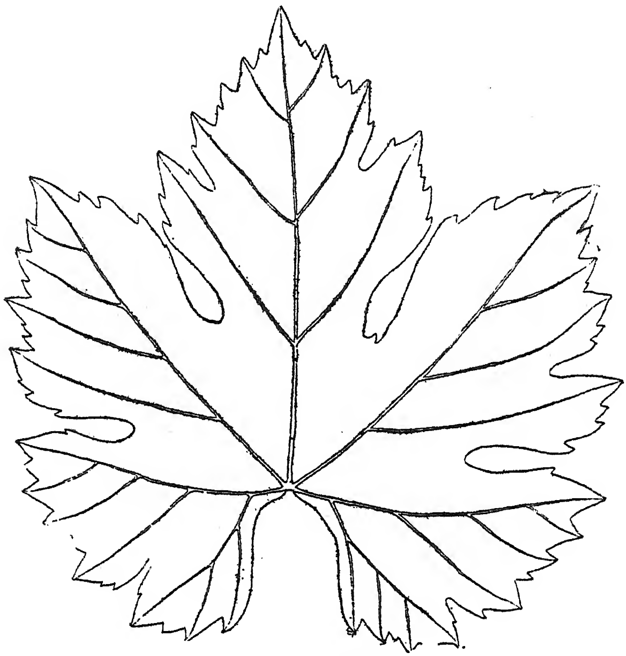


FIG. 14.—Aramon leaf from a sterile sucker on the same vine.

From what we know, therefore, of the fertility of particular vines, or particular parts of grape vines, it is evident that selection enables us to eliminate from a vineyard all unproductive stock by means of grafting, or avoid reproducing undesirable features shown in the parent vine.

APPOINTMENT OF INSPECTOR OF BEES.

Ex. Co. 3071/1902.

Department of Agriculture,
Perth, 16th September, 1902.

HIS Excellency the Governor in Executive Council has been pleased to appoint JOHN SUTTON Inspector under the Contagious Diseases (Bees) Act.

W. B. HOOPER,
for Director of Agriculture.

AGRICULTURAL LECTURES.

By A. Despeissis.

SEVENTH LECTURE.

Action of Fire on Soils.—In unlocking the dormant elements of plant food in soils, "air," "fire," and "water" play an important part.

Tillage, fallowing, and drainage we have seen stimulate the sweetening action of air on agricultural soils. We will now consider to what extent fire acts on soils, and with what results.

Fire assists the agriculturist in three ways, viz.:—

1. For ridding the surface of the ground of cumbersome brush and wood, as is done in clearing wooded land.
2. In destroying or altering a portion of the humus in marshy lands, or other soils containing too large a proportion of vegetable matter, in order to improve it.
3. In roasting or calcining heavy clay lands and thereby altering both its texture and its chemical condition.

This operation is somewhat costly, and need not be applied to the whole field. On many farms there are here and there patches of stiff clay which are often bare and unproductive, or patches of soil which are hard to reduce to a good tilth and on which crops are liable to fail. Although this trouble may sometimes be reduced by drainage or by liming, in the application of fire we possess a more ready means of dealing with it.

The usual way is to rough plough these patches in the autumn and again plough them when they are wet and sloppy in the spring. In this manner, when the ground is broken up again after drying for the purpose of burning, large clods are obtained. These are intermixed with brush-wood or coal-dust, and built up into heaps, care being taken to allow a few vent holes through the mass for the purpose of promoting the combustion and allowing air to get at the fire. Earth is then shovelled over the heaps to prevent the mass from breaking out into flame, and the whole is then allowed to smoulder away.

By this means the temperature is also kept as low as possible, and when cooled the clay crumbles to pieces.

Chemically the clay is a hydrated double silicate of aluminium and of potassium. During the process of burning, the water of hydration is driven away, and the compound silicates are decomposed. The lime that is in the soil partly takes the place of the potash in the double silicate of aluminium and of potassium, and this liberates a certain amount of potash, which then becomes available as plant food.

With regard to the loss of humus or organic matter, clay in itself being a powerful absorbant of humidity, ammonia, etc., that loss has not really the significance it would have on a lighter and a more sandy soil. It will therefore be seen that the ground so treated, instead of being heavy and to a great extent unproductive, becomes friable, non-adhesive, warm, and dry.

In the hands of experienced clay-burners, one ton of coal-dust will burn about 20 tons of clay. Wood or peat-turf are probably the best kinds of fuel to use, as they do not produce so high a temperature.

If proper and moderate burning loosens the potash and makes soluble the phosphoric acid which was locked up in the organic matter, and makes the soil more friable, over-burning causes some of the potash which had become soluble to pass again into the insoluble state, portions of the clay will cohere into hard lumps like bricks, and will not again be reduced to powder.

Coal Ashes as a substitute for Burnt Clay.—Burned clay ashes at times find a substitute in coal ashes, which often answers admirably in making lighter heavy clay land. It is far better than sand, which is often washed out of the clay by heavy winter rains.

Paring and Burning.—Land covered with coarse matted sods are often considerably improved by the action of paring and burning of the surface; the paring is done by means of the wheel plough, with a very broad share. The sods are heaped up and set fire to. When these heaps are well on fire, fresh sods are put on the side where the fire is strongest, so as to partially choke it. After burning, the ashes and remnants of the sods are scattered over the field, which is then ploughed and sowed. This practice rids the fields of the seeds and roots of all weeds and coarse grasses. It also destroys great quantities of insects which have been allowed to accumulate in the ground.

Effect of Fire on Peat.—The burning of peaty soils, such as the bed of swamps or moorlands, is at times injudicious, but in some circumstances is attended with much good. When the layer of swamp muck is thin, it is much better to simply drain it; but in cases where the formation is a deep peat bog, slow surface burning is attended with much good. The process is not one of properly called combustion, but rather a system of carbonising the turf and spongy mass on the surface. In order to carry out the operation, deep trenches are cut into the peaty mass in order to dry it. The coarse growth of rushes and water plants on the surface is then pared off and left exposed to the sun and wind to dry. After the water has been dried out, these sods and rubbish are heaped up and set on fire. They should only be allowed to burn slowly, without flames. Should flames burst out, these should be reduced at once by throwing damp sods on them. After burning, the residue will be found to consist of a mass of charred stuff and not ashes. This is what should be aimed at. This is then spread on the ground,

ploughed, and the crops sown. The advantages of such treatment are many, viz.:—

1. By this treatment the rank, cumbersome vegetation is destroyed.
2. Its ashes as well as the ashes of the burnt peat become available for the immediate use of the crops and for the improvement of the peat that is left.
3. The burning and the charring of the peaty mass favourably affects the physical conditions of the soil.
4. The heat, besides, distils off and removes the resinous matters which prevent the dry peat from properly soaking in water; it also destroys the vegetal acids which make the moorland sour.
5. It also favourably affects the solubility of the inorganic materials in the peat, as is done in the case of clay burning.

Bush Burning.—When the selector takes possession of his selection, his first effort is directed towards clearing or burning off the land. In doing this a considerable amount of the humus that had accumulated during the growth of the timber becomes destroyed; this is almost inevitable. On the other hand, however, a large quantity of ashes is left on the ground, which are scattered evenly over the ground before ploughing. These ashes will, to some extent, enrich the ground and benefit it. This is particularly so in regard to stiff clay lands.

The destruction of the nitrogen in the humus is, in a measure, compensated by the riddance of much cumbersome rubbish, besides the addition to the soil of an amount of phosphoric acid, of potash, and of lime, proportionate with the amount of wood burnt, and by the improvement in the texture of the surface soil.

Action of Water on Soils.—Air and fire have been found to be active agents of soil improvements; water is the third element which acts beneficially on soils. It is a solvent of plant food, a vehicle and a distributor of the materials which constitute the tissues of plants and of animals, a regulator of the temperature, lowering it in the summer and raising it in the winter.

Water is a manure in itself; it also enables manure to act. However much plant food there may be in the soil it is not available to plants until dissolved by water. Thus a small amount of manure upon moist land gives far better results than a heavy dressing upon dry land, which depends on the rainfall for its moisture.

Plants are made up mostly of Water.—Analysis shows that there is as much as 90 to 94 pounds of water in every 100lbs. of some of the most succulent fruits and vegetables; such as asparagus, cabbage, cucumbers, lettuce, melons, rhubarb, tomatoes, and strawberries, as much as 80 to 85 pounds of water in every 100lbs. of such fruit as apples, apricots, grapes, lemons, and pears.

Green fodder contains 60 to 85 per cent. of water, according to their state of maturity; grain plants when in blossom contains 75 per cent., and mature leaves of trees 60 per cent.

By the use of the microscope, it has been found that nourishing liquids and sap do not run freely and uninterruptedly through tubular channels, but more from cell to cell by a process called "osmosis," which is the tendency of fluids to mix or become equally diffused when in contact. It is a sort of molecular attraction not unlike that of adhesion.

It is thus essential that the contents of the cells, which enter into the structure of the growing plant, should be in a half liquid condition in order that nourishment and construction material should be carried and distributed uninterruptedly.

Wilting, its Cause.—When the plant cells cease to be distended with fluid sap they become flaccid and the plant wilts. This is caused by the osmotic pumping action of the roots, which draw the necessary supply of water from the soil failing to keep pace with the exhalation of vapour from the leaves.

Unless this flaccid state is promptly remedied by an influx of sap, these cells thicken and lose their elasticity. The plant first becomes stunted and vegetates, to finally dry up and die. A few hours of a hot day in the summer will be sufficient to dry out a plant completely if new supplies of moisture were not constantly brought into it to make good the loss.

Whenever respiration of the plant threatens to stop for want of moisture rising from the roots, we find in watering and in irrigation a ready means of stimulating it.

EIGHTH LECTURE.

Irrigation.—By irrigation is meant the watering of land at will, the flooding or saturating of land with large quantities of water. To be thoroughly successful, irrigation must be conducted on a porous soil, with deep and efficient drainage. It has the effect of minimising the risks of raising profitable crops, and so greatly increasing their luxuriance. In some cases, however, although the quantity of the product is increased there is a deterioration in the quality of it, and all crops which can be raised without watering are superior in flavour and in nutritive power to those grown by the aid of irrigation. Garden produce, where profusely watered, is at times so insipid as to be hardly eatable. Comparative weight is, therefore, not always a true test; the heaviest potatoes, for example, are not always the best. In irrigating, too much water used all at once is as bad as too little used at short intervals. In the first instance, the ground becomes water-logged, and the soluble elemen s plant food are washed down beyond the reach of the roots of the crops, or are washed out of the ground altogether. In the second place, the water does not penetrate to any depth, and leaves the

subsoil hard and dry. The superficial roots of crops are encouraged at the cost of the deeper roots, and if the water is cut off for a longer period these superficial roots suffer and dry up, and the crops are reduced both as regards quantity and quality. It also dissolves and displaces the saline matter, which exists more or less in certain soils, and by reason of the alternate damping and evaporation of the water holding the salts in solution, these salts will after a time accumulate close to the surface, where they corrode the roots as well as that portion of the bark which comes in contact with the soil.

Water for Pot Plants.—After a time pot plants often show symptoms of fading away, and of sickness; they become pot-bound, and, although sufficiently watered, the accumulation of toxic substances about their roots makes their surrounding sour and unhealthy. Activity can be restored by washing these toxic substances out of the soil. This can readily be done by copious waterings with warm water, heated to 125° to 135° F., which is continued until the water, which at first was coloured, runs out clear. The plant is then transferred to a larger size pot, and the fertilisers which were washed out are also restored in the form of weak solutions of saltpetre, of superphosphate of lime, or of such suitable fertilisers.

As the article on irrigation, which was published in the October issue of the *Journal*, dealt at length with irrigation, we would refer our readers to that paper, as a repetition in this issue is hardly necessary.

NINTH LECTURE.

Warping.—The system of warping may be described as an artificial means of making an alluvial soil. It consists in flooding low-lying land with water containing large quantities of mud, which is allowed to settle, after which the water is drained off. The most extensive system of warping is that as practised in the Nile Valley; it is also adopted in the low-lying lands of Lincolnshire and Yorkshire, in England. Lands thus treated receive a rich coating of fine earth matter, which makes it more fertile and fit for cultivation. It is more beneficial on sandy and peaty soils than clay lands.

Claying and Mixing Soils.—When soils have some particular defects, physical or chemical, great advantages may be obtained by mixing sand and clay. This process involves a considerable amount of labour, and therefore often proves very costly. Sand opens the mass of clay and makes it more permeable to the air, water, and also the roots of crops. The clay, on the other hand, makes the sand more retentive, and causes it to absorb a greater quantity of moisture. It also consolidates sandy or peaty soils and improves their chemical composition.

A system of "dry warping" consists in transferring the sediments obtained by "wet warping" to sandy or peaty soils. One hundred and thirty-four cubic yards are necessary to cover one acre with a layer one inch deep.

Marling.—The word "marl" applies to mixtures of clay, loam, or sand with variable proportion of calcareous earth, in the shape of carbonate of lime which varies in proportions from 5 to 50 per cent. of the carbonate; it also contains at times appreciable quantities of phosphates and potash, and of organic matters rich in nitrogen, which add to its fertilising power and increase its value. Marl, in its action upon the soil, is milder than quicklime, and can be applied in much larger quantities, for the reason that it does not possess any of its caustic properties.

In the case of soils having too much sand, and which are comparatively unproductive in consequence, great improvements result from an application of marl. It derives greater power for holding manure and for retaining a greater amount of moisture. Conversely a heavy clay is, by its use, rendered more porous and more friable, as happens when lime is applied as an amendment.

Marl may be divided into three kinds; first, stone and slaty marl; secondly, shell marl. This is found in the beds of the estuary rivers of Western Australia, as the Swan and the Murray. It consists of a deposit of clay and silt mixed with *debris* of oyster shells. And thirdly, earthy marl, found constituting the hard pans beneath the soil of swamps and marshes.

Liming.—The use of lime is of the greatest importance in practical agriculture. It is employed in almost every country, and from the most remote period, in the form of marl, shells, shell sand, coral, chalk, and quicklime.

We have seen that calcium, which is one of the elements of plant food, is essential to plant life; at the same time it cannot be said that crops removed from the land rob it to any very great extent of that element. On the other hand, a soil which contains less than one per cent. of lime is always improved by an application of that substance.

We have previously seen that an acre of arable soil one foot deep weighs on an average 3,500,000lbs., so that one per cent. of lime in such a soil would mean 35,000lbs.

As a general rule, all fertilisers, as well as farmyard manures, add more lime to the soil than what is taken from it by the crops. We may well ask ourselves how is it that a dressing of lime has such a beneficial effect on crops, and at the same time that so little is actually assimilated and removed by the crops? How is it that arable soils which contain already large stores of lime are benefited by further heavy dressings of that substance?

Action of Lime on Soils.—In order to give an answer to these questions, we must first consider the action of lime on soils, both heavy and light. It breaks down stiff clays, making it more friable and pervious to water. When a handful of lime is thrown into a bucket of muddy water the water soon clears, and the impalpable clay precipitates and settles at the bottom of the bucket. This liming is often practised for clearing the muddy water of wells.

When lime is added to clay land, a similar action takes place. The fine particles coalesce into larger granulated particles. This process is known as the "flocculation" of clay; in other words, they coagulate into larger aggregations. As a result of the change in the plastic and viscous characteristics of clay, water and air are able to penetrate it more freely, it becomes easier to cultivate, and as a result of cultivation is more readily reduced to a fine state of tilth, and becomes warmer and mellower.

Lime on Light Soils.—When lime is added to light soils, it consolidates them and cements their particles somewhat as mortar might do, and so improves their capillary condition; it alters and improves matters already in them, and also helps the action of fertilisers that may be added to them. Poor soils, however, which have already little substance in them, are not much benefited by the application of lime, and may, in the case of quicklime being added, be robbed of their already moderate store of organic matter.

Lime also corrects acidity, and sweetens sour soil by neutralising the humic and other organic acids in the ground. A moderate amount of acidity at times exists in the ground.

Lime decomposes organic matter, and favours the rapid disorganisation of the vegetable matter in the ground, and promotes decay. On this account liming gives good results after green manuring in helping to reduce to a state of mould the turned in greenstuff. It decomposes minerals, and loosens the potash in the soil.

What Happens when Limestone is Burnt.—Under the action of great heat limestone, which is carbonate of lime, undergoes marked changes. The heat drives off the water and carbonic acid, leaving calcium oxide, better known as quicklime, behind. In this form a marked tendency exists to reunite with water and carbonic acid, this it does with much hissing, and in giving off the heat it had stored up in a latent form whilst being burnt in the kiln, during the process of slaking it increases in bulk to twice the amount. In buying lime for applying to the ground, it is important to bear in mind this change, as the freight and cost of handling quicklime is only about one half of that of slaked lime. Apart from the saving in freight, etc., quicklime or caustic-lime also possesses a more energetic action on clays than does carbonate of lime or slaked lime.

The quantity of lime to be applied depends on the amount of vegetable matter the soil contains. Then again, while some farms apply sufficient at one time to last from 15 to 25 years, it will always be found better to apply a much smaller quantity oftener, say, about 25 bushels of quicklime or 50 bushels of slaked lime to the acre, 15 bushels of quicklime or 30 bushels of slaked lime is a safe application to a soil that is quite thin, and contains but little vegetable mould.

Over limed soils are impoverished of their organic matter and crumble down like dust, the restoration to them of that organic

matter in the shape of farmyard manure or of green manuring suggests itself as the one rational remedy; it may also be necessary to consolidate the loose, open soil with the use of a heavy roller or other similar mechanical means.

Some fertilisers must not be applied with or immediately after lime. No substance containing lime, either in the caustic or slaked form, or Thomas's phosphates or phosphatic powder, must be used with sulphate of ammonia, ammoniacal guano, or any organic matter yielding ammonia, or soluble phosphates or superphosphates.

Gypsum.—This is like lime; it is also known as calcium sulphate, sulphate of lime and land plaster, when roasted and it is deprived of its water it is known as plaster of Paris. Like lime, it flocculates clay soils, making them more pervious and improving their drainage and mechanical condition. It acts as a potash solvent, and when applied to the land, sets it free from its unavailable state, making it readily available to the crops. It fixes volatile ammonia in dry farmyard manure, and turns it into sulphate of ammonia. It is particularly suitable for leguminous crops, and especially clovers, which do best on a friable soil well supplied with lime.

TENTH LECTURE.

Manures and Manuring.—In a state of nature, soils yield a certain small produce, varying with the season, all of which is returned to the soil by the decay of plants or droppings of animals. It thus happens that vegetation is continuous. The air can supply all the carbon, hydrogen, and oxygen required, the soil supplying the ash constituents, viz., iron, calcium, magnesia, potash, phosphorus, sulphur, soda, silica, chlorine, and sometimes manganese. The air partly, and partly the soil, supply the nitrogen.

Effect of Cropping on Soils.—In the artificial state of farming, the produce is removed as corn, wool, meat, and milk; and the ash constituents and nitrogen then removed must be returned, or the soil will become exhausted. Before the soil becomes exhausted it gradually gives poorer crops. This is the case whether a variety of crops are raised in succession or in rotation. In the latter case this gradual exhaustion is slower, especially if part of the crops is fed off on the ground. Chemically speaking, a fertile soil is one containing an abundance of available plant food. When that food fails the land needs manuring.

A manure is a plant food introduced into and incorporated with the soil in order to supplement the stores of plant food already existing there.

How were the Elements of Plant Food Discovered?—The question remains, how, amongst the numerous and complex substances which enter into the composition of soils and air, do we know those which are essential to plant life and those which are not?

Science, and especially chemical science, has answered this question for us.

In the first instance, careful and complete analysis were made of all the component parts of plants. Then careful trials were made of plant growth in "artificial soil" and also in "chemically pure water."

The artificial soils consisted of perfectly pure quartz sand, first calcined, and then treated with dissolving acids, and subsequently washed clean with water. In this absolutely pure sand, seeds were sown and made to germinate, then fed with either pure water or water containing in solution one or several or all the substances about which information was sought.

The water culture consisted of distilled water, absolutely pure, in which had been dissolved all or all but one, in turn, of the substances under trial. In this way science proved that all the elements mentioned above are essential to plant life, because when any one of them is entirely withheld the plant will not develop, although it may draw from the water used, or from the air, every other element found in it when the plant was properly grown.

From these experiments it follows that if a plant or a crop does not find within its reach, and in a form in which it will be able to utilise it, any one of the substances necessary for its proper growth, it is as badly off as if it lacked all those elements found to be necessary.

In the state of nature the soil is pretty well stocked with most of those elements, and only three are in most cases either singly or severally deficient, viz., nitrogen, potash, and phosphorus. A few others, such as calcium, iron, and sulphur, are often found beneficial in order to secure a bountiful crop. This is not all that chemical science has done for the farmer. Besides finding out the necessary constituents of plant food, it has also and is every day discovering and suggesting fresh sources of fertilising substances. It measures their value and indicates methods for their treatment, so as to prepare them to be drawn upon by the growing crops.

Chemical science, moreover, prescribes in what state of combinations it is either profitable or wasteful to use these fertilisers.

It also shows whether these fertilising substances are as rich as they are reported to be, or whether they are altogether destitute of fertilising ingredients.

General Manures.—Farmyard and fowl manure may be called general manures, as they contain all the necessary elements of plant growth.

Special Manures are those which contain one or several but not all the necessary elements of plant growth, ex. saltpetre, muriate of potash, and superphosphates.

Different plants have different powers of extracting their food from the soil, and for that reason special mixtures or combinations

of manures are used in connection with the cultivation of those plants.

Special manures are used under certain circumstances :—

1. When the soil is deficient in some particular necessary plant food, such as potash or phosphoric acid.
2. When a crop has particular requirements.
3. When a soil is, generally, in a high condition.

In this state a special manure may be employed to stimulate the growth of a crop, or so to render active the dormant wealth of a soil, *e.g.*, nitrate of soda is often applied to cereals, and increases the crop considerably. This increase removes from the soil a quantity of ash constituents or mineral matter which were not supplied. In this manner the soil is therefore drawn upon to a greater extent than if the nitrate of soda had not been employed; and if thus treated the soil will become exhausted more quickly than without the use of the special manure. It would, therefore, be desirable to add potash and phosphoric acid to restore the amount taken off consequent to the use of nitrate of soda.

Nitrogen is the most important element which the cultivator adds to his soil. It occurs in abundance in the air in a free or uncombined state, but in that state it is not available to most crops, except those of the leguminous class, on whose roots are gall-like swellings known as root tubercles, which are formed under the influence of micro-organisms living in the soil. It has been found that the presence of these bacteria and root tubercles enables some plants to draw from the vast stores of nitrogen in the air a supply which will enrich the ground in that valuable element and enable it to grow more abundant crops.

The more common source of nitrogen on the farm or at the orchard is found in farmyard manure, which consists of—

Farm Yard Manure.	Water ...	70	
	Organic matter	27	—Nitrogen, ·4 to ·65 per cent.—9 to 15lbs. per ton.
	Ash	3	Phosphoric acid, ·2 to ·5 per cent.=4 to 10lbs. per ton.
		——	
		100	Potash, ·3 to ·6 per cent.=5 to 13lbs. per ton.

A good dressing per acre, 5 to 10 tons.

The value of farm yard manure lies as much in the elements of plant food it contains as in its porosity and its spongy nature.

The other forms of organic nitrogen, *i.e.*, the nitrogen of animal and vegetable matters which is chemically united to carbon, hydrogen, and oxygen, are :—

Ammoniacal Guanos are the best of the concentrated complete manures, as they have nitrogen 8 to 12 per cent., phosphates 15 to 25 per cent., and a little potash. It is a very valuable manure for most crops, but is rather expensive. It more nearly resembles farm-yard manure in its composition than other artificial manures, and

its great use is to replace this manure when it is scarce. A good dressing, 2 to 3 cwts. to the acre. They are collected on the islands off the coast of Peru and Chili.

Dried Blood.—The refuse of slaughter house. Being a very complex substance, it is also a very valuable manure, contains nearly as much dry matter as flesh—*e.g.*, about 23 per cent. When dried without other substances it contains about 10 per cent. water and 8 to 10 per cent. ammonia, with a little phosphate and traces of potash. It is one of the best forms of manures in light lands, and is not readily washed away. Often mixed with gypsum, which decreases its value; useful for making composts. Fair dressing per acre, 3 to 4 cwts.

Dried Nightsoil or Poudrette.—Contains 2 to 4 per cent. nitrogen, 3 per cent. phosphate, and 1·5 per cent. potash; often mixed with gypsum and earth, which reduces its value. A bulky manure, which would hardly pay to carry a long distance when freight and carriage is a consideration.

Other forms of organic nitrogen are those of seeds, such as cotton seed cake and other oleaginous seeds after the extraction of the oil.

Leather and peat are also classed as nitrogenous manures, but they are comparatively slow in their effect on vegetation, and for that reason are less valuable.

Nitrogen occurs as minerals, and notably ammonium salts and nitrates and nitrites.

Sulphate of Ammonia supplies one of the cheapest forms of nitrogen in the market. When pure, it contains 24 or 25 per cent. of ammonia, equivalent to 20 of nitrogen, and is one of the most concentrated forms of nitrogen available. It is obtained from coal gasworks, and extracted from the gas liquor, and is purified of the ammonia sulphocyanate (a plant poison) it contains before being put in the market. As it is not quite so soluble as nitrate of soda, it is not so liable to be washed out of the soil as are nitrates. A simple test for showing the absence of most, at any rate, of the impurities with which sulphate of ammonia is likely to be adulterated is to throw a pinch of the sulphate on a red-hot iron plate; the sulphate of ammonia, if pure, will be quickly volatilised and dissipate entirely. Applied at the rate of $\frac{1}{2}$ to $1\frac{1}{2}$ cwt. per acre in the spring, mixed with some dry, well-ground material such as sand, earth, or other fertilisers, so as to ensure its even distribution.

Nitrate of Soda, as imported from Chili, contains rather more than 15 per cent. of N., or 18 to 19 per cent. ammonia. Its price is almost prohibitive in Australia. More soluble than sulphate of ammonia, and for this reason especially useful in a dry season, owing to its being deliquescent. Applied at the rate of $\frac{1}{2}$ to $1\frac{1}{2}$ cwt. per acre in the spring, mixed with some dry, well-ground material, so as to ensure its even distribution.

Soil or manure analysis often express the nitrogenous contents as Nitrogen or as Ammonia. And in order to better understand the difference between the amount of each, it is useful to remember that 17 parts of ammonia (NH_3) contain 14 of nitrogen (N); and that 66 parts of pure sulphate of ammonia, or 85 parts of nitrate of soda, also contain 14 parts of nitrogen. Excess of organic nitrogenous manures, it should be borne in mind, are often productive of harm, and cause such diseases as "die back" of the trees. In white-ant infected districts it must also be used with caution. "I have used sheep manure for orange trees," writes a Narra Tarra fruit grower; "it acts very well, but proves a hotbed for white ants."

Phosphorus is, next to nitrogen, the most costly ingredient of fertilisers, in which it occurs in the form of phosphates of lime, iron, and aluminum, or, in case of superphosphates, partly as free phosphoric acid. In good soils it rarely exceeds 2 per cent.

The trade uses, with regard to phosphoric acid, several terms which to the layman are not very familiar, thus:—

Bones and phosphatic rocks do not dissolve in water, and therefore are not easily absorbed by roots of plants.

In these substances the phosphoric acid is combined with three parts of lime, and is called *tri-calcic phosphate.*

$$\left.\begin{array}{l}\text{Lime}\\\text{Lime}\\\text{Lime}\end{array}\right\}\text{Phosphoric acid.}$$

When sulphuric acid or oil of vitrol and water are added to that tri-calcic phosphate, part of the lime leaves the phosphoric acid and its place is taken by water, and one part of lime unites with the sulphuric acid.

$$\left.\begin{array}{l}\text{Water}\\\text{Lime}\\\text{Lime}\end{array}\right\}\text{Phosphoric acid.}$$

This is *di-calcic phosphate,* insoluble in rain water, but readily dissolved and used by roots, and also soluble in weak acids.

When, owing to larger additions of sulphuric acid, two parts of lime give place to two parts of water.

$$\left.\begin{array}{l}\text{Water}\\\text{Water}\\\text{Lime}\end{array}\right\}\text{Phosphoric acid.}$$

The result is *mono-calcic phosphate.* This is readily soluble in water, but when mixed with soil, and in the presence of lime, alumina, and iron, it tends to become insoluble or to revert to the di-calcic form, and is then said to be "reverted."

The lime removed, combining with the sulphuric acid forms sulphate of lime, or land plaster. Di-calcic and mono-calcic phosphates are sometimes spoken of as acid phosphates when thus sold in commercial fertilisers.

Soluble phosphoric acid implies phosphoric acid or phosphates that are soluble in water or in a solution of ammonium citrate. It diffuses into the ground, and thus reaches the feeding rootlets of the crop, instead of lying inert in the soil, as do the mechanically-mixed insoluble phosphates, until the rootlets find them out and attack them.

Insoluble phosphoric acid requires a stronger solvent than ammonium citrate to make it available as plant food.

The chief sources of phosphatic manures are:—

Bones are found in commerce broken up as "half-inch," "quarter-inch," and as "bonedust"; the finer the better, as they act more quickly. Commercial bones are either "raw" or "steamed" and degelatinised. Their respective composition is—

	Raw Bones.		Steamed Bones.
Water	10 per cent.	...	10 per cent.
*Organic matter	33 ,,	...	18 † ,,
Phosphates ...	50 ,,	...	58 ,,
Carbonate of lime	4 ,,	...	8·5 ,,
Sand	·3 ,,	...	1 ,,
Alkaline salts ...	2·7 ,,	...	4·5 ,,
	100·0		100·0

* Equal 3·5 to 4·5 ammonia. † Equal 1·4 ammonia.

Bonedust and half and quarter-inch have a similar composition to the raw product they are made from. The coarser the bones the heavier should the dressing be. Bonedust is applied at the rate of 3 to 4 cwts. to the acre.

Phosphatic Guanos, such as Abrolhos and Sharks Bay guanos, contain 44 to 45 per cent. of tri-calcic phosphate, and only ½ per cent. of ammonia, the balance being mostly sand and moisture. They can be got in several ton lots at a very reasonable price, and answer well when mixed with a small proportion of a more soluble phosphate, such as concentrated superphosphate and sulphate of ammonia. A fair dressing would be 3 to 4 cwts. to the acre.

Thomas' Phosphate Powder, or Basic Slag, is another source of phosphates. It is derived by means of the Thomas Gilchrist process in making steel from pig iron by smelting it in converters lined with lime; when the iron is melted the air is blown through, part of the iron and impurities are oxidised, and the phosphoric acid combines with the lime, forming phosphate of lime. This contains 14 to 17 per cent. of phosphoric acid, equal to 30 to 36 per cent. of phosphate of lime, and also 40 per cent. lime, and 18 per cent. iron oxides, and 6 per cent. sand. It is very cheap in England, where it sells at the factories for £1 a ton, and is retailed at 30s. It is so finely divided that it acts very readily.

Coprolites and Apatites constitute mineral phosphates of great value, either ground into a fine powder or for making superphosphates. They occur in some geological formations under the form of concretions, and consist of the fossil excrements and

remains of extinct animals. They vary in richness from 10 to 75 per cent. of phosphates.

Superphosphate of Lime.—Either of the raw materials referred to already are ground and treated with sulphuric acid, thereby made more soluble, and hence quicker in its action. The actual composition of superphosphate varies with the material of which it is made, and ranges from 35 to 40 per cent. down to 20 per cent. phosphates rendered soluble. In this state, owing to its diffusibility, superphosphate is able to permeate through a greater quantity of soil, and penetrates further than other merely mechanically-divided phosphates, and thus more readily taken up and assimilated by crops. A good dressing consists of 2 to 4 cwts. per acre; or, in conjunction with farm-yard manure, 2 cwts.

Fermented Bones can readily be prepared on the farm by mixing with bones $\frac{1}{3}$ their weight of earth or burying them in the manure heap, moistening them with water, urine, or liquid manure, and covering the whole heap with earth. After a time, depending on the temperature, the bones enter into fermentation, and crumble to powder, when they are dug out and used. Fermented bones act more rapidly than raw bones, and can be compared in their action to bone superphosphate.

The relation of Phosphoric Acid (P_2O_5) to Phosphate of Lime ($Ca_3P_2O_8$), such as is expressed in soil or manure analysis, is as 142 is to 310, or a fraction less than half. Thus bonedust containing 50 per cent. of phosphate of lime contains somewhat less than half this amount of phosphoric acid, or, in exact figures, 22·58 per cent.

FRUIT CASES FROM LOCAL TIMBER.

The scarcity of fruit cases which last season reached an acute stage has stimulated local settlers to turn out suitable fruit packages at a reasonable price. One or two owners of saw benches in the Blackwood in previous seasons cut cases from our native gums; but although these presented many desirable features, it is reported that the boards were liable when dry to split when nailed together.

Mr. Holdsworth of the Blackwood, has surmounted this difficulty, and has submitted for inspection a couple of fruit cases of the ordinary size, which do not show this particularity. The cases are delivered at Hester's Siding along the Blackwood railway at 7s. 6d. per dozen in shooks. All the boards have nail holes bored into them and can thus be put together without splitting.

XANTHORRHŒA HASTILIS RESIN OR BLACKBOY GUM.

By S. S. DOUGALL, Analytical Chemist.

With the view of discovering a good solvent for this resin, or at least a solvent that could be used technically for the extraction of the resin from the tree, the following investigation was made.

Very few of the ordinary solvents have any action on this resin, as will be seen from the following results. Nor have these solvents any better action on the resin when used in conjunction with neutral salts, but even if they did assist in dissolving the resin no other salt than that of a nitrate could be used practically. The resin is soluble in the different menstrua in the following proportions. In each case 10 times the amount of solvent was used to that of the resin, except in the case of the 10 per cent. ammonia solution, where 20 times the amount was used:—

AMOUNTS SOLUBLE IN—

No.		
1.	Bisulphide of Carbon	3·94 per cent.
2.	Benzole	3·30 „
3.	Light Petroleum Spirits	·64 „
4.	Gasoline	·64 „
5.	Oil of Turpentine	3·00 „
6.	Amylic Alcohol	3·00 „
7.	Water	4·00 „
8.	10 per cent. Ammonia Solution ...	40·00 „
9.	5 per cent. Caustic Alkalies ...	completely soluble.
10.	Ethylic Alcohol	„ „
11.	Ether	„ „

In the solvents 1 to 7 the resin is practically insoluble, the amounts dissolved consisting principally of oil and a little carbo-hydrates.

No. 8.—The 10 per cent. ammonia solution dissolves 40 per cent. of the resin, the amount soluble contains the most of the picric acid forming bodies, yet the insoluble in that solvent still contains a fair amount of the picric acid forming bodies. So with the amount of loss of picric acid and the cost of treatment, quite places this solvent out of the list of practical working solvents.

Caustic Alkalies (potash and soda).—Although these are complete solvents for the resin, the cost of the alkalies and the cost of after treatment makes them quite useless as solvents to extract the resin from the tree.

Ether.—This is a true solvent for the resin, dissolving it completely and in a very short time; but the high price and difficulty of recovering the ether, except with a large loss, places it quite out of the list of practical solvents, more especially when compared with the next solvent.

Alcohol (Ethylic) Methylated or otherwise.—The resin dissolves completely in this solvent in a very short time, and is quite within the price of a practical working solvent. Methylated alcohol could be obtained at a price of not more than 3s. per gallon, but most likely far less. The whole of the alcohol would be recovered in the process of extraction with very little loss.

Not only could the alcohol be recovered, but the resin would be of a better quality, and command a much higher price than that not treated with alcohol. The resin got by crushing or such means is not in a fit state to be used for the manufacturing of picric acid or any other thing or use it may be intended for. Before it is fit for use it has to be dissolved in alcohol to get rid of the fibre, and then recovered from the alcoholic solution before it is fit to be used for the manufacturing of picric acid, etc. By the use of the alcoholic method of extracting the resin, the after treatment of the crude resin by alcohol would be saved and therefore increase the price of the resin. The best process to follow for the extraction of the resin from the tree as a practical working method should be as follows:—

The tree to be crushed or smashed up into small pieces; by this process a certain amount of the resin will be separated from the fibre and sifted off, and kept separate from the alcohol-extracted resin, as they will bring different prices. The crushed fibre is placed in an iron digester, which is supplied with a lid through which a pipe passes to carry the alcohol to the digester. At the bottom of the digester there is a trap pipe which leads into an iron retort or boiler, which can be heated by steam or fire to drive off the alcohol and leave the pure resin. The alcohol, as it runs down through the fibre in the digester, takes up the resin. The alcohol, when it is driven off from the retort or boiler, is condensed at a higher level than the digester; it then runs back into the digester—in fact, the process is continuous until all the resin is dissolved out. As the same alcohol is used over and over, very little alcohol is needed. After the extraction is completed, the digester is emptied, and is now ready for refilling. The resin from the retort or boiler is now ready for any use it may be wanted for without any further treatment.

The amount (average of several experiments) of picric acid I was able to make from the sample of resin sent me was 3·09 per cent., but with a stronger acid than I could buy here, I have no doubt a much higher percentage could be obtained.

If anyone wishes to start this process, I will be prepared to give sketch plans of the whole plant.

LIME AND ITS RELATION TO AGRICULTURE.

By Percy G. Wicken.

Lime, according to the works of ancient writers, was one of the earliest substances used for improving the productiveness of the soil. It was used for this purpose two or three hundred years B.C. It has been largely used in Europe for several centuries, and the earliest American writings show that lime took a prominent place in the agricultural history of that country.

Lime has also been used to a more or less extent in the Australian States, but has by no means been universally adopted, and its use in a judicious manner would prove beneficial to the Australian farmer in many ways. The subject of the use of the lime is an interesting one, and the following notes may prove of service to settlers.

The term "lime" is generally understood to mean quick or caustic lime or calcium oxide, chemical symbol (CaO). When any form of carbonate of lime, limestone, oyster shells, or shell marl, is burned, the carbonic acid is given off and lime of quicklime is produced. In burning, the calcium carbonate undergoes decomposition, the carbonic acid being thrown off and the caustic or quicklime remaining in the kiln. The fuel generally used in burning is wood, and some of the ashes from this will be found as impurities in the lime.

Lime may be burnt in a number of ways from the rough pile of logs with the stone or shells piled on top, to the most modern furnace made of solid masonry, fire-bricks, and boiler plate steel, but the result is about the same, except in the cost of carrying out the operations.

Burning.—Limestone or any carbonate of lime begins to decompose at about 300° c., and the temperature usually employed is indicated by a bright red heat, it should not be allowed to exceed 1,100° c. The facility with which lime is burned depends upon the porosity and composition of the stone, the size of the lumps, and the quantity of air passed through the burning mass. Again, the expulsion of carbonic acid is facilitated by the introduction of steam into the mass. This is accomplished by lime burners by watering limestone which has become dry by exposure to the air. If the temperature rises too high, the lime is said to be "dead burnt" or "over burnt," and will not slack. In burning, limestone retains about the same volume, but loses about 44 per cent. in weight, that is, 100lbs. of stone yields about 56lbs. of lime.

Terms.—We often hear the terms "agricultural lime" and "building lime" mentioned, as if they were different articles, but in reality no difference exists, and the same article is used for both purposes. Sometimes the term "agricultural lime" is used to mean "building lime" that has been air or water slacked, and sometimes

refers to the kind of stone from which it is derived; more often, however, any inferior lime which is not suitable for building is termed "agricultural lime." The various kinds of lime used in agriculture are as follow :—

Stone Lime.—Good limestone contains from 50 to 55 per cent. lime (CaO) and 40 to 44 per cent. carbonic acid, with smaller amounts of magnesia, silica, iron, and aluminia. Such limestone when burnt would produce the best quality of caustic or quicklime, containing from 90 to 98 per cent. of calcium oxide (CaO). Freshly-burned lime, when removed from the kiln, will weigh about 90 to 95lbs. to the bushel, and when slaked will make about three bushels in volume, and is found in pockets in coastal limestone of West coast, between Cape Leeuwin and Carnarvon. Large area of good limestone at the head of the Great Bight, from Israelite Bay to Eucla, reaching 150 miles inland. Small deposit at Southern Cross.

Magnesian Limestones.—Magnesian limestones or dolomites vary very much in their composition, and may range in carbonate of lime from 20 to 80 per cent., and in carbonate of magnesia from 10 to 60 per cent. The average of such limestone when burned will produce a lime containing from 70 to 85 per cent. of calcium oxide, and 5 to 20 per cent. of magnesium oxide. Magnesian lime weighs about 75 to 85lbs. to the bushel, and when slaked will make about two bushels for one by volume. There is a small deposit of this rock at Millie Soak, near Cue.

Oyster Shell Lime.—Oyster shells contain from 90 to 95 per cent. of calcium (lime) carbonate, and will produce when burned a comparatively pure lime, which should contain from 85 to 95 per cent. of pure calcium oxide if it has not been excessively mixed with ashes in burning. Freshly-burned oyster shell lime weighs about 60lbs. per bushel, and will make when slaked about two and a half bushels for one by volume. Oyster shells suitable for burning are to be found in most of the estuaries in the coastal districts.

Slaked Lime.—The process of slaking is the taking up of water, either from the air or by water being poured over the lime. The lime when it has absorbed all the water it can forms calcium or lime hydrate. It also absorbs some carbonic acid from the air, and forms carbonate of lime.

The Maryland Agricultural Experimental Station recently published an article on this subject, from which I extract the following figures :—

	Weight per bushel before slaking.	Total weight after slaking.	Number of bushels after slaking.	Weight per bushel after slaking.
Good stone lime	93lbs.	135lbs.	3	45
Magnesia stone lime... ...	80lbs.	110lbs.	2	55
Oyster shell lime	60lbs.	100lbs.	2½	40

Gas Lime.—Quicklime is used at the gas works for removing the impurities of the gas. After it has been saturated with these impurities it is of no further use to the gas manufacturer, and is sold for agricultural purposes under the name of gas lime. It varies greatly in composition, and contains the sulphides and sulphites of lime, which are injurious to the young plants if the lime is applied too fresh. The action of the air on these sulphides and sulphites changes them to sulphate of lime (gypsum), therefore the exposure of gas lime to the weather for some time improves its agricultural qualities. Its weight is about 65lbs. per bushel.

Gypsum, or Land Plaster is a combination of lime with sulphuric acid, forming sulphate of lime. It occurs in Nature in large deposits, forming beds of rock, which are ground to a fine powder for commercial purposes. It varies in colour from white or light yellow to gray. It is of advantage to place gypsum in stables, etc., as it absorbs the ammonia given off from the manure, and can afterwards be applied to the soil.

Marl is the term applied to deposits which contain a large quantity of partially-decomposed shells. These are decomposed by exposure to the weather, and such soils contain large quantities of lime, which when burned furnish a supply of quicklime.

Value of Lime as a Manure.—Although all crops contain more or less lime in their composition, the amount is so small that it is hardly worth considering, and sufficient lime for the requirements of all crops is to be found in almost all soils. The quantity of lime taken from the soil by a heavy crop varies from 10lbs. per acre in a crop of cereals to 90lbs. in the case of clover.

It is the chemical action of lime on the soil which gives it its value, by making the plant food already in the soil more readily available. This is brought about through the action of the lime in decomposing the mineral matter in the soil.

Lime also hastens the decomposition of organic matter and inert nitrogenous compounds of humus in the soil and promotes the formation of ammonia and nitrate compounds from the same. Lime promotes nitrifying ferments and makes possible their existence in many cases that would be impossible without its presence. Lime is especially valuable if applied after a crop has been turned under for green manuring, as it acts chemically on the organic matter and causes it to decompose rapidly. All these facts teach us that lime is not a substitute for manure, but a reinforcement of it.

The continual application of lime to any soil without the addition of fertilisers tends in a short time to make the soil sterile, and it is this fact that gave rise to the old saying: "Lime enriches the father, but beggars the son." The excessive use of lime on a farm may be of benefit to the tenant for a few years, but is bad for the owner, and in some parts of the world landlords have forbidden their tenants by contract from using lime on their estates.

Lime is of great value in places where the land has an acid reaction. This acidity or sourness of the soil is generally due to the decomposition of the remains of plants in the soil forming organic acids and this condition is more noticeable on wet than on dry soils. The acidity or sourness is readily corrected by lime, and the good effect of lime on sour grass land is very noticeable.

How to know if Lime is required.—The easiest way in which this can be determined is to obtain a few pieces of blue litmus paper (this can be obtained from almost any chemist for a few pence); place a piece of this paper in contact with the moist soil; if the soil is sour it will turn red, and the degree of acidity can be determined by the quickness with which it changes colour and the density of the redness produced.

Method of applying.—Clayey soils can stand much more frequent and heavier applications of lime than light sandy soils, as the action tends to improve the mechanical condition of such soils, the quantities applied vary according to the soils and the customs prevalent in various parts of the world from about two tons per acre for light soils to as high as 12 tons per acre on cold heavy clays, and such applications are made at intervals of from five to six years.

Our soils in this State are mostly of a light nature, and a much smaller dressing of lime at more frequent intervals would be more likely to prove of benefit, except in some of our swampy lands in the South-West District, where a heavier application would most likely prove beneficial.

The autumn is the best time of the year to apply lime to the ground, but if not convenient to apply at this time, a moderate application may be made at almost any time. The best method to apply lime is to make small piles of lime on the surface at regular intervals, and cover these with earth; the moisture in the soil will soon cause the lime to slack, and as soon as it has come to a powdery condition it should be spread evenly over the soil and harrowed in. If the soil is very dry, the application of a small quantity of water to cause it to slack may be desirable. It should be remembered that lime in its caustic or quick state has the most power of producing the necessary chemical and physical changes in the soil; and, therefore, the object should be to get the lime into the soil in its native state, and well mixed with the soil before it has time to lose any of its active principles. Lime should *not* be allowed to "air slake" before being applied to the soil, as by doing so it absorbs the carbonic acid from the air and is changed back to the carbonate, the form in which it existed before burning, and consequently the labour expended in burning the limestone has been lost. In America powdered caustic lime has been placed on the market, which can be sown with the ordinary seed drills direct into the land, and this is, theoretically, the best way, as it applies the lime evenly, and in its best possible condition; but, unfortunately, we in this State have not yet reached this point.

The tendency of lime is to sink downwards in the soil; and, therefore, it should not be placed too deeply into the ground, and after spreading, the running of a set of heavy harrows over the surface is generally sufficient to incorporate it with the soil. If ploughed under, a large part of the benefit of lime is lost.

Another benefit the use of lime to the agriculturalist is that it is of great benefit in contending against various fungus diseases of plants, it is said to be of special benefit to prevent "club-foot" or "foot-and-toe" disease of turnips, and in some instances scale in potatoes. It also destroys and keeps in check slugs and worms, and may no doubt destroy the larvæ of various insects. It is also stated to be of assistance in encouraging the growth of nitrifying organisms, and of the root tubercles or leguminous plants.

The following list gives the classification of a number of plants according to their action in regard to lime. The experiments were conducted by the Rhode Island Experimental Station :—

Plants benefited by lime.		Plants indifferent to lime.	Plants injured by lime.
Spinach,	Pea,	Corn,	Water melon,
Lettuce,	Peanuts,	Millet,	Serradella,
Beets,	Tobacco,	Hungarian Millet,	Blue Lupin,
Celery,	Sorghum,	Golden Millet,	Sheep sorrel.
Onions,	Lucerne,	Rye,	
Parsnips,	Clover,	Potatoes,	
Cauliflowers,	Barley,	Carrots,	
Cabbage,	Wheat,	Red-top grass.	
Cucumbers,	Oats,		
Egg plants,	Timothy grass,		
Asparagus,	Kentucky blue grass,		
Kohal Rabi	Seed fruits,		
Dandelion,	Stone fruits.		
Swede Turnip,			

NOTICE TO BEE-KEEPERS.

The Department of Agriculture being desirous of affording all information and assistance to bee-keepers, has recently appointed Mr. J. Sutton, Contagious Bee Inspector, under the Contagious Diseases (Bees) Act. Those bee-keepers wishing to take advantage of Mr. Sutton's assistance and advice, should organise meetings of the bee-keepers in their district, when, on notifying the Department of Agriculture, arrangements will be made for Mr. Sutton to attend.

THROUGH THE GIPPSLAND OF WESTERN AUSTRALIA.

By G. Buchanan.

The country in the most Southerly part of the State and lying between Bridgetown and Albany, on account of its distance from any railway or town, is known only in name to the average citizen. There are, however, a number of good reasons why this part of the State should be brought more prominently before the public. Principal among these reasons is the splendid quality of the soil, which is proved, whenever it is tried, capable of yielding splendid crops of almost all kinds of farm produce, and particularly such crops as oats, potatoes, peas, maize, pumpkins, and indeed all products that require a rich soil and an abundant rainfall. Even if the soil throughout this district were not of first-class quality, the splendid rainfall which its geographical position assures would make it productive. Taking the average of nine different points through the country from Bridgetown to Mt. Barker, and including these two places, it will be found the rainfall registered for the year 1901 was over 27 inches, with a record of 138 wet days for the year. With such a rainfall, distributed as it is well through the year, it will be apparent that the district is splendidly adapted for farming purposes. While the last few years has seen very satisfactory progress in the area under cultivation and the production of farm products required for local consumption, there is still a great deal to be accomplished. Though the quantity of wheat and chaff grown locally nearly reaches our requirements, oats, maize, peas, potatoes, butter, cheese, and bacon have to be imported in large quantities. The reason of this is not difficult to find. The high price of chaff and wheat during the past few years has made the cultivation of the drier and more easily cleared portions of the State a highly remunerative business, with the result that this class of country has been much sought after and eagerly taken up. When the production of chaff and wheat, however, yield a surplus over local requirements, the profits on the cultivation of this class of country must fall, or the farmer will have to turn his attention to the growth of other crops and a more varied system of farming. It is when this condition of affairs is reached that the solid value of the rich, heavily-timbered, and well-watered country in the South-Western part of the State will be realised. What the drier districts have done in the direction of meeting local requirements for wheat and chaff, the South-Western district is quite capable of doing in regard to beef, butter, cheese, potatoes, oats, and onions. Through the Warren River district, of which something has been heard of late on account of the reported discovery of petroleum, there is an immense area of magnificent land which, if brought under cultivation, would do more to reduce the cost of living in this State than could the most beneficient tariff imaginable. On account of its distance from the

railway line and the very heavy cost of clearing, the country at present is given over to grazing, the cattle running through the bush and picking up a living where they can. In its virgin state it is difficult to estimate what is the carrying capacity of the country, but it may be asserted roughly that not more than one beast to 100 acres will be found on most of the pastoral leases. On freehold land, where the timber has been killed and removed, and grasses established, a very different state of affairs exists, and some splendid illustrations are provided where the settlers have given good fodder plants a trial. Where the clearing of the land costs anything from £5 to £25 per acre, it follows that something valuable must be grown on the land if the person who spends the money is to receive an adequate recompense for his outlay, and the way that such grasses as lucerne, cocksfoot, rye grass, and white clover thrive in this country shows that the clearing of the land can be made profitable by the establishment of these plants. While travelling through this district recently I saw all these grasses doing extremely well wherever they had been tried. Lucerne does particularly well. Mr. Lynam, whose place is within three miles of Bridgetown, has a patch of it growing on a hillside where it was sown two years ago, and at the time of my visit it was undergoing the third cutting for the season. The growth was thick and strong, and the plants over 2 feet in height. From its appearance I should say it would make at least two tons of hay per acre for the cutting. Mr. Lynam informs me he cuts five and six crops during the season. At Mr. P. Wheatley's place at Balbarrup, and Mr. T. Muir's, Deeside, I also saw patches of lucerne doing equally well. Both of these plots have been down for seven or eight years, and are now giving quite as heavy returns as the one just quoted. In none of these cases is any irrigation practised, nor is there anything exceptional in the situation, except that the land was well cultivated and manured before the lucerne was sown. With such prolific returns, however, it would pay well to go to considerable trouble and expense to establish a few acres of this valuable fodder. Though this country is very sparsely settled, enough cultivation has been carried on to prove the productiveness of the whole of this district. The great distance from market has prevented the settlers from attempting farming at all extensively. Around all the homesteads, however, is to be seen some land under crop, and from these a fair estimate of the capacity of the soil may be formed. Wheat is not a conspicuous success in this locality, but oats thrive remarkably well and yield extremely heavy crops of both hay and grain. As there was something like 800,000 bushels of oats imported into this State during 1901 it will be seen that plenty of demand exists for this cereal alone to absorb the product of at least 30,000 acres of land. At almost every place a small area of potatoes is grown, and the appearance of the crops at the time of my visit was conclusive evidence of the suitability of the country for this valuable crop. The yields per acre vouched for by the growers in response to my query as to what they considered a fair crop were almost beyond

credence. The smallest quantity named was six tons per acre, and exceptional returns of 10, 13, and in one case 16 tons were mentioned. While I see no reason to doubt these figures, especially after seeing the crops at present growing, it is not amiss to say that the areas under potatoes in all cases being small, the soil is no doubt well prepared and heavily manured, so that similarly heavy crops could hardly be expected under ordinary field practices. A most interesting point in regard to the growing of potatoes in the Warren district is the fact that the tubers grown in that district will keep for any reasonable length of time after being dug. A great disadvantage under which the potato grower labours in this State is that he must sell his crop as soon as it is out of the ground, for the tubers will not keep if stored. This fact accounts for the slump which annually occurs as soon as the potato crop is harvested. The grower has the prospect of good prices for his crop right up to the time it is dug, but unless he is fortunate to get on the market early, he probably finds the price has fallen pounds per ton by the time his crop is sold. As soon as the glut is over the price goes up again, and growers who can store a portion of their output realise good average prices for their stuff. Potato-growing in a district where good crops can be obtained and the tubers kept until the market is favourable, should be one of the most profitable industries to which local cultivators could direct their energies.

Onion-growing is another industry which must in time be recognised as one of the staple ones in this district. The manner in which this valuable plant thrives gives promise that in the future we may become independent of outside supplies, while the cultivation of this crop is one specially suited to the small farmer, who can utilise the labour of his family to obtain the greatest returns from a small area.

To write about the Warren district, or indeed any part of the South-Western country, without making particular reference to its fruit-growing capabilities, would be like describing Kalgoorlie without mentioning its gold. Though the distance from market has been too great to allow ordinary farm produce to be profitably cultivated, the high price of fruit leaves a good margin of profit after the expense of carting even 50 or 60 miless is deducted, and the settlers have not been slow to realise that apple-growing is a profitable business. While the settlers are stock raisers first, they are also fruit growers to a man, and the orchards throughout this country not only look well and promising, but are highly productive and profitable. The distance from market makes the growth of soft fruits unprofitable, so attention is given to apples, and the good folk who fondly believe that apples cannot be grown in any quantity in West Australia would no doubt be astonished to see wagon loads of the finest fruit being hauled by bullock and horse teams into Bridgetown in the season. It is only within the last five or six years that the planting of fruit trees has been undertaken at all extensively, but at all the old homesteads there is to be seen a small area of old trees which have grown to immense size and are wonderfully prolific.

Instances of single trees yielding from 15 to 30 cases of fruit are by no means uncommon. The most of the young trees planted during the last few years are now coming into bearing, with the result that the output of apples from this district is larger each year. It will, however, be years before these trees reach anything approaching their full development, so that the supply of apples must be an increasing quantity for many years to come. All the best varieties are grown, and there seems little to choose where all do so well, but such kinds as Cleopatra, Rome Beauty, Fine Crown, Rokewood, and Jonathan are amongst the most popular sorts. Among the older trees in the past there were many that, not being on blight-proof stocks became infested with the "Woolly Aphis," which, on account of the cool, moist, climate, finds this district most suitable for its development. To overcome this pest, the orchardists have gone vigorously to work grafting over their trees to resistant kinds and keeping constantly at work with the spray pump and kerosene brush, with the result that their trees are now almost wholly free from the ravages of this insect. While apples are the principal fruit grown, enough of other kinds are cultivated to prove that, with the exception perhaps of citrus fruits, all classes can be most profitably cultivated. Pears and peaches grow and fruit exceedingly well; though apricots, while growing to a great size, do not bear well as a rule. In common with the experience in most other parts of the State, the cherry is found to be a very shy bearer throughout this locality. Though a very small kind, the name of which I could not ascertain, fruits abundantly. All kinds of plums fruit with amazing profusion in this locality, the trees being simply covered with fruit. This is not the experience in many other districts, where the Japanese varieties are the only kinds that can be relied on to give any return. It is interesting to note that the walnut thrives well in this district. There are some old trees around the homesteads which have reached a great size and bear fine crops of splendid nuts, equal in every respect to those grown elsewhere. In the production of small fruits this district is full of promise. English gooseberries do wonderfully well, and bear heavy crops, while strawberries have also been tried successfully. Strange to say, I saw no raspberries growing, though from the climate and the fact that other small fruits do so well, I think there can be little doubt that these berries would grow and fruit well. Altogether the soil and climate of this district combine to suit it for the cultivation of a wide range of marketable commodities, the half of which the narrow limits of this article will not permit me to mention. Enough, however, has been said to show that this part of the country is adapted for the production of a class of produce that cannot be grown successfully in the hotter and more arid districts, and the settlers who have courage enough to face the difficulties of clearing and cultivating this country are safe to meet with a satisfactory reward.

GARDEN INSECT PESTS.

By A. Despeissis.

The following Paper was delivered before the Fremantle Horticultural Society at their meeting of the 3rd of December:—

The subject I am asked to introduce to-night is one which, it is obvious, cannot be done justice to in the length of a short paper.

The mere enumeration of the pests which prey on garden plants would prove appalling by reason of its length, and would certainly be tedious.

Those who expect to hear inside of 20 minutes all there is to be said about the subject of this paper will be sorely disappointed. After years of continuous observation and recording the experience of other students of insect life, there is still left an amount of information to be gathered concerning garden pests which only those who have applied themselves to the task can well appreciate. This I do not say with a view of discouraging the study of garden pests, as, with a little common sense and timely interference, much good can be achieved in combating them and ridding plant of their presence.

Amateur gardeners, as well as professionals, who concern themselves about the well being of their plants, have continuously to contend with two classes of pests which injure their crop. The first of these are *noxious insects*, the second *parasitic fungi.*

Insects vary greatly in their shape, size, and colour, but on broad lines they all possess, when seen in their full grown stage, certain features which differentiate them from other animals. They possess three pairs of legs, attached to a body divided into three definite portions—a head, a thorax, and an abdomen.

Some of them, indeed the majority, undergo during their development well-marked transformation or stages: 1st, the egg; 2nd, the larva or caterpillar; 3rd, the pupa or chrysalis; 4th, the adult or imago stage. Moths and butterflies, amongst others, belong to this class. In two, or may be three, periods of their transformation they take no food, and are fixtures; during these periods they do no actual harm. Thus, butterflies and moths are inert in the egg as well as the pupa stages; and some of them, such as the codlin moth for instance, do not feed. Yet it is during these periods of rest and transformation that it is often easier to attack them. These insects undergo what is called *complete transformation*, in contradistinction of others which undergo *incomplete transformation.* This second class, such as grasshoppers and locusts, have eggs which, in hatching, give forth young insects which only differ from the full-grown ones in size and in possessing no wings. Instead of changing from larva to pupa, they proceed, by a series of moulting or casting off their skin, to the mature stage, and become

imago. During these successive moultings they are known as "nymphs."

Again, some insects lay eggs and are oviparous; while others bring forth their young alive, and are viviparous. The majority of them, however, proceed from the egg, whether that egg is deposited and cemented to the plant by means of a viscous secretion or whether they give birth to young ones. In the latter case the female insect generally carries the egg internally until the hatching period arrives.

So much for the life history of insects considered broadly. A number of varieties depart from the pattern laid down in several minor details which cannot be touched upon in this paper, although a clear understanding of these particularities is of great assistance in combating pests. They often constitute the weak point of the armour it is meant to penetrate, and serve as a guide in directing the attack against them.

Almost as important as an understanding of the life history of pests is a knowledge of the manner they attack plants when taking their food.

In that respect noxious pests may be considered, irrespective of their classification, names, shape, or colour, into two general types: *biting or chewing insects* and *sap-sucking insects.* The former are often leaf-eaters or bark-nibblers, or, again, wood and fruit borers. They are provided with jaws by which they can gnaw the surface of the food plant, and chew it.

The latter feed on the juices of the inner tissues of the host-plant. They are armed with a pointed tube-like beak, which they thrust into the tissues of their host-plant and suck out the sap.

Of the biting or food-chewing insects, some are:—

(1.) Root-eaters; such as the white worm of the cockchafer; the larvæ of the cicadæ.

(2.) Others, bark-nibblers; as certain kind of beetles and of weevils.

(3.) Some are leaf-eaters; as slugs, caterpillars, saw-flies' larvæ, the carpenter bee.

(4.) Others injure the bud, the blossom, or the fruit; as the strawberry weevil, the codlin moth.

Of the sucking insects, in a like manner, some are:—

(1.) Root-sucking insects; as the woolly aphis and phylloxera of the vine.

(2.) Others, ordinary bark-sucking insects; as the mealy bugs.

(3.) Some leaf and bud or fruit-sucking insects; as the rose and the orange aphis, the red and other scales, and plant bugs.

When fighting against biting insects, their food plant is best coated with substances which will act as internal poisons; whereas,

when directing the attack against sap-sucking insects, the treatment must be such as hurts and kills by direct contact; they are external irritants and act from the outside, either closing the breathing pores or killing by irritation of the skin.

To the first category belong the various combinations of arsenic, and chief amongst them "Paris green," a chemical combination of arsenic and copper. When unadulterated it contains 55 to 60 per cent. of arsenic. It is almost insoluble in water. It is applied either 1st, dry in a state of impalpable powder, mixed in the proportion of 1oz. of Paris green with 2lbs. flour, slaked lime, road dust, or ashes; 2nd, or in a liquid mixture in the proportion of 1oz. in 10 gallons of water. It should not be used in conjunction with any acid substance which would dissolve the arsenic it contains and make it caustic, but on the contrary it is always a good plan to add to it a handful of lime, which has the property of turning insoluble any trace of caustic arsenic it contains. Being a heavy substance it quickly settles to the bottom of the pumping tackle, and requires agitating.

Other combinations of arsenic, such as London purple and arsenic and soda solution, are also used; but genuine and unadulterated Paris green is the the best. A little glue or flour paste may be added to cause it to adhere better, especially to plants with glossy leaves.

Hellebore, unlike the arsenites, which are mineral poisons, is a vegetable poison, and is less dangerous. It is a powder made of the roots of the white Hellebore, and kills both by contact and by being eaten. Very effective when fresh, it loses its strength by standing. In dozes 1oz. to 3 gallons of water it is much used against the pear slug and leaf-eating worms.

Pyrethrum, or Insectibane, is also a poison, and is effective when fresh, but loses strength when exposed to the air. It is made from the powdered flowers of plants of the genus Pyrethrum. That light-brown powder is dusted over the plants or sprayed, in the proportion of Pyrethrum one tablespoonful, boiling water two gallons. It kills by contact, and should be applied as long as the insects persist. Burnt over hot coals in the conservatories and greenhouses it rids plants of aphis and other insect pests. Pyrethrum are easily cultivated, make pretty borders, and a supply of fresh flowers could, without trouble, be raised in every garden.

Kerosene in the form of an emulsion with soapsuds, or mechanically mixed with water in the form of a misty spray, in the proportion of one of kerosene and four of water, will kill nearly all insects, and not injure the foliage.

Resin Compound are known to be very effective against scale insects. One of the best formulas is: caustic soda, one pound; resin, five pounds; water, 25 gallons. Two ounces of Paris green may be added to this when used.

Tobacco is one of the safest and most valuable insecticides, and may be applied in several ways: either as a fine dry powder against slugs and aphis, or as a decoction of three to four gallons of water to one pound of tobacco; or in fumes, when burnt in the greenhouse.

Carbolic Acid, especially in its crude state, is a valuable insecticide, as an emulsion made by mixing one quart soft soap, or about one pound of hard soap dissolved in two gallons of boiling water, and then adding one pound crude carbolic acid; and applied with a cloth or a brush it is efficacious in preventing the attack of tree borers. It must not in that state be applied to the foliage.

Bi-Sulphide of Carbon.—A very volatile fluid, the fumes of which are destructive to all animal life, is used for killing insects under ground; this is done when the plant is dormant, by boring a hole into the ground and pouring a little carbon-bi-sulphide and kerosene mixed. It is highly inflammable.

Coal Tar is excellent to drive insects away, or entrap them.

Hot Water, at a temperature of about 125° F., is very efficacious for killing plant lice. Amongst other substances which are used against insects must also be mentioned lime and gas lime, quassia chips, kainit, fir-tree oil, sulphate of copper.

Natural Checks.—Although economic entomologists have already tested many valuable insecticides, and so compounded them that they kill insects, but leave plants uninjured, yet there is in keeping noxious insects in check even more efficacious allies than the spray pump and the insecticidal mixtures.

All insects, injurious or beneficial, have many natural enemies of their own to contend with. Some are of a higher order in the scale of animal clsssification, such as lizards, frogs, and other reptiles; birds, moles, etc. Others, more numerous, belong to the insect world itself.

Amongst these, some which attack noxious insect pests from the outside, and either devour them or suck their vital juices, are called *predaceous* insects, *e.g.* ladybirds, spiders, soldier bug, black-ground beetle.

Others, called *parasitic* insects, differ from the predaceous ones, in so far as they live inside the bodies of their victims, and ultimately kill them. Amongst these parasitic insects the more numerous are ichneumon wasps, which entomologists classify amongst the hymenopterous, or four-wing flies. Another class of flies, with only two wings, and for that reason known as dipterous insects, contribute largely to the ranks of insect parasites.

But even these parasites are frequently subject to the attack of still smaller parasites, which prove as fatal to them as they did to their insect hosts. The first of these parasites are, for that reason, known as primary parasites, to differentiate them from the second, called secondary parasites. When introducing parasites into an

orchard or a garden, therefore, it is of the greatest importance that we should have a clear idea whether we are introducing an ally which will prove beneficial, or whether we will add to the list of our pest enemies another insect which will prove mischievous. Such a work is better left in the hands of experienced people, and may prove a dangerous tool in those of the tyro gardener.

Besides insect parasites, injurious insects are also attacked by even more minuscule foes. These are germs of contagious diseases, which at times stop an insect plague with remarkable suddenness.

These germs are of two orders: some bacterial and inward, *e.g.* green potato and tomato caterpillars; others superficial, cover their victims with silklike threads, and belong to the mould family, *e.g.* the African locust fungus—the housefly fungus.

CHAPMAN EXPERIMENTAL FARM.

By A. Crawford.

The work on the farm is being pushed on as rapidly as possible. One paddock of about 180 acres is now fenced with the Cyclone fence, and the contractors are at work and will soon have finished another 400 acres.

Two contracts for clearing have been let: one of thick jam and wattle country, at 34s. per acre; of this about 25 acres are cleared and ready for the plough, which I hope to start at work very soon now so that the sun may get at and sweeten it some time before sowing. Another lot of about 30 acres is let at 25s. per acre; this is poor land and sandy. By the time the first 25 acres is ploughed a good part of the other should be ready for ploughing. This latter is a kind of sand plain with little or no timber on it, but a heavy growth of prickly scrub, that is a fair sample of an enormous area of similiar country. If it can be shown that it will pay to grow wheat on this land, it will open up a splendid prospect for the whole of the Geraldton and Northampton districts. It will mean that the country that now is only sheep runs will, wherever it is available, be brought under the plough.

Complaints have been made by old settlers in the district that it scarcely pays them to grow wheat at the price that they have been obtaining for it in the past. There were practically no buyers in the district. That difficulty would soon be remedied, as one firm has informed me that it is their intention to send a buyer up into the district this season, while an Eastern District firm has already been making inquiries as to the amount of wheat available in the

district, with the intention of establishing a flour mill as soon as there is a sufficient supply to warrant it.

It is intended to grow several varieties of wheat and oats on the Experimental Farm, and to use different kinds of fertilisers to see what suits the district best, and seed from the most suitable varieties will be obtainable at the farm.

It is not intended to go in for a large number of small experimental plots, as, from the climate, medium and late varities can never prove a success. The experiments will be made on a fairly large scale, and confined to a few varieties that are known to be good, with the idea of finding out which is best for this district. By so doing, the expense will be reduced to a minimum and the crops will be of sufficient extent to pay for the labour.

As the district is so early, there seems to be a good opening for potato-growing, and if they are got in in good time, the potatoes should be ready for digging at a time when prices are high.

To that intent I am having some of the better land cleared so as to give them a fair trial this coming season.

Other root crops should also do fairly well, such as beet and mangles; if the latter do at all well they would be a great help to dairying in the summer months.

On all sides there has been a great desire expressed by the settlers that good stock should be kept on the farm, and the services of stud animals made available as well as young stock sold.

To that end I have already obtained four Dexter Kerry heifers and these have all calved now, but rather unfortunately have all bull calves. Perhaps this is not altogether unfortunate, for next season I will have some of these young bulls to dispose of. I have had all the heifers broken in and am having them milked now, and am hand-rearing the calves. The heifers are milking fairly well, considering that they are only on wild oat chaff at present. I may say that when it was known that I was about to import some of the Dexter Kerry cattle Mr. Hallett, a large dairyman in the district, asked me to import a cow and a bull for him, which I did, and since then I obtained another bull of the same breed for Mr. Chas. Harper, of Guildford. I have also had a number of inquiries from people who would like to purchase the Dexter cows I have, and from all appearances there is likely to be a large demand for this breed in the district.

I have also purchased two pure-bred Shropshire rams of high quality; one imported from Tasmania and one from Victoria, and six pure Shropshire ewes. I hope to establish a stud flock of Shropshires on the farm, and have a number of pure rams to dispose of each year at prices within reach of the purses of the farmers in the district.

I also intend to get about a couple of hundred ordinary ewes, as I think I will have grass sufficient for them, and cross them with

the Shropshire rams, and thus have some lambs ready for next season.

There is a great lot of scrub land on the farm, and to help to clear that cheaply I have obtained three Angora goats from the Federal herd of South Australia. It is intended to obtain a number of common goats and cross the Angora with them, castrating all the males and then crossing the females back to the pure Angora, when, at the second cross, they ought to pay to shear. The Angora and the Angora cross make excellent meat, and can scarcely be distinguished from good mutton. I have already had inquiries if I had any pure Angoras for sale.

I hope later on to get a few good pigs for breeding purposes, and have young well-bred pigs to dispose of at moderate prices. It is also intended to pay some attention to the breeding of turkeys and poultry, and I have now five very fine American bronze turkeys, imported from Victoria; the gobbler, although only a little over 12 months old, weighs 39 pounds. This is an industry greatly neglected here, and one that I believe would pay better for the time taken up than any other industry on the farm. I have also obtained five very fine Golden Wyandotte fowls, which is one of the best all round breeds of poultry there are, being good layers, especially in the winter, and good table poultry as well. It is expected that both young turkeys and Wyandottes will be available for sale next season. In going about the district I was surprised to find that there were no bees in it at all, so I have obtained a hive of pure Italian bees from Mr. Sutton to try how they will do.

It is also my intention to make a small orchard this coming year, and put in various kinds of fruit trees.

Later on I also intend going in for ensilage, and will experiment with a number of fodder crops to see what will give the best return for that purpose.

In one way I have been rather handicapped, that was as regards labour. It was difficult to obtain, and I am not nearly as far on now with the work as I had hoped to be.

I have been in communication with the principals of several of the Agricultural Colleges in the Eastern States as to what kinds of wheat they find best adapted for the dry districts, and am indebted to Mr. Pye, of Dookie, and Mr. Potts, of Hawkesbury College, for much valuable information regarding the varieties of wheat, oats, and barley most suited for dry districts, and hope that the information thus received will save a lot of useless labour in the way of experimenting.

INTRODUCTION OF BLACK SCALE PARASITES.

REPORT BY T. HOOPER.

On the 9th October ult. Mr. Lounsbury, Government Entomologist of Cape Colony, very kindly gave me two boxes of parasitised black scale (*Lecanium Oleæ*) to take to Western Australia. I took every care of them, and had them put in the cool chamber of the ship, where, the chief steward told me, the temperature was kept about 40 (forty) deg. Fahrenheit.

On the 28th October the material was placed in large glass jars, covered with cambric. I got four primary parasites (*Microterys sp.*), one each, on November 1st, 3rd, 4th, and 11th respectively; two (*Scutellista Cyanæ*) primary parasites, one each, on November 11th and 12th respectively.

I examined material in jars on the 25th November, and found an average of eight dead (*Scutellista Cyanæ*) per stick. I submit samples for Mr. Lounsbury's information, also samples from same material of—

(*a.*) Light dove-coloured fly, with spots on wings.

(*b.*) Silver and brown moths.

(*c.*) Dark green fly, with legs and under part yellow.

(*d.*) A small yellowish fly; looks not unlike sample 1123 sent; but sample rather poor, and not named by Mr. Lounsbury in list.

Of the secondary parasite (*Tetrastichus sp.*), sample No. 1125, I secured one specimen. I have kept duplicates of *a*, *b*, *c*, and *d*.

The few primary parasites secured have been placed inside gauze muslin on scale-infested plants.

The Horticultural and Viticultural Expert to the Department adds the following notes:—

Mr. Lounsbury would no doubt feel interested to learn what fate has met the parcel of Black Scale parasites from the Cape he had entrusted to the care of Mr. T. Hooper.

This information was conveyed to Mr. Lounsbury, who was further asked to identify the specimens forwarded, Mr. Compere, our entomologist, being away on a collecting mission.

Further contributions of the *Scutellista* fly to fight the Black Scale would be most welcome.

Mr. Lounsbury was also asked whether the *Scutellista* (which is parasitic) or Lecanid Scale in Ceylon, is the same as occurs at the Cape. If so, we might have a better chance of introducing it from that country. Due care would, of course, be exercised against the introduction of secondaries. Perhaps he would be able to give us the name of someone in Ceylon who would help us in this matter.

Mr. Lounsbury might also be good enough to send us the Cape Brown Scale parasite, which is an excellent one.

From the four parasites *Microterys sp.* obtained from the 1st to 11th November, a second generation of eleven insects were hatched between the 1st and 9th of December. From this brood it is hoped that at least one hundred will be bred out early in January.

THE FRUIT FLY.

Some few months back the Director of Agriculture caused a circular letter to be sent to various parts of the world containing the following queries:—

(1.) The Fruit Fly is reported as occurring in your locality.

(2.) What methods, if any, are employed to hold it in subjection, and with what results?

(3.) Are there any natural enemies that prey upon this fly, and if so, to what extent do they destroy it?

In response to these questions the following interesting letter has been forwarded to the Department by the consul of Nice, Maritimes, France, who obtained the information from Mr. Henry Hooper of that district:—

I.

Halterophora Capitata and *H. Hispanica*, commonly known as the "Mediterranean" and "Indian" Fruit Fly respectively, are distinct varieties, but, their life-history and destructive habits being identical, they may for all practical purposes be treated as one and the same pest. It is quite possible that both are to be found in Western Australia, as they are in Sicily, Italy, Malta, and undoubtedly throughout the entire Mediterranean littoral. I reply to the queries as follows:—

(1.) This Fly is not reported as occurring in the Alpes Maritimes, but, in common with innumerable other pests equally unrecognised, it does occur.

(2.) A merely desultory and academic (by the Horticultural Societies) interest in "Fruit Pests" is shown in these parts, and no organised effort whatever is made to suppress them. Diseases of the vine are treated in a routine, somewhat haphazard, fashion; the "Olive Fly" (*Heiroun*) is recognised as the cause of enormous annual loss, but remains unmolested. Certain more or less successful efforts are made by individual growers to eradicate the *fumagina* which infests all citrus fruit trees; beyond this, the diseases and pests of the orchard pass almost unheeded and practically uncombated.

(3.) The writer had occasion, some two years ago, to enter into the very question of this particular pest, and then, being frankly told by the *savants* here that "nothing was known about it"—in fact, a specimen of the perfect fly (*Halt. Hisp.*) was not recognised—the interest and aid of Mr. John Borg, Curator of the Palace Gardens at Malta, were enlisted. Mr. Borg, an enthusiastic, well-versed entomologist, was willing and able to give exhaustive information. *Inter alia*, he (Mr. Borg) says (and this pretty well answers "Q. 3"):—"I was not able to meet with any insect (*Ichneumonidæ* or *Encyrtidæ*), which is a parasite of this fruit-fly, in any of its stages."

The natural foes of this pest evidently only are—cold, moisture, insectivorous birds, frogs, lizards, etc.

This pest is beyond doubt one of the most serious of all which endanger the fruit industry; its eradication, therefore, calls for heroic measures in which, where possible, the State should lead. In Western Australia, where the fruit industry is yet young, preventive and protective legislation tending to compulsory organised united action, stringently administered under properly qualified Government supervision, is both feasible and indispensable, and therein seems to rest the *one chance* of exterminating this terrible menace to a promising industry.

Let it be noted that these flies do not confine their attacks to the orange, but are equally destructive to peaches, nectarines, pears, figs, etc., and very possibly failing these, would resort to wild fruits, if any suitable to their purpose existed.

Any district in which the pest appears should be *at once*, and, in a liberal sense, prescribed and put under treatment for a term of at least *an entire year*, so that the fly be attacked in *all* its stages, and no chance brood missed. Mr. Borg accounts for as many as four broods in the year. Every effort should be made to destroy the fly itself—though it may be only in the grub or *pupa* states that much can be done. Still, the perfect insect should not be neglected. Boards smeared with honey hung throughout the orchard will attract many flies, and constant attention to

these boards will account for a goodly number of these and other pests. Insectivorous birds should be protected and encouraged. Common fowls at large in the orchard will do good.

All fallen fruit should be gathered from the ground as fast as it falls, leaving no time for the grub to quit the fruit for the soil. All fruit on the trees showing signs that it has been "touched" should be gathered, and this, with the fallen fruit, immediately burnt. Children could be usefully employed to do this. Thus the vast majority of the grubs of each brood may be accounted for.

In a few hours after entering the soil the grub assumes the *pupa* state, in which it remains, according to the season and conditions of weather, any time from as little as five days to the duration of an entire winter. In this State (the *pupa*) the pest is vulnerable to cold, moisture, and disturbance. In an infested orchard the soil, therefore, should be continuously worked, exposing the *pupaè* to all severities of weather. Irrigation, where possible, would be most effective. It goes without saying that this prolonged attack must be carried out with unremitting thoroughness and whole-heartedness. From nothing less can success be hoped. The danger is a very real one. Let this pest get a firm footing in Australia, and the fruit industry is well-nigh doomed. It may be ranked in importance with phylloxera (the *San Josè Scala*) and the Codlin moth.

I may add that in fighting pests very particular attention should be directed to the small private garden, with its one to half-a-dozen trees. These pest-breeding spots always have been, and always will be, a standing menace to successful commercial fruit culture.

II.

The fruit industry hereabouts is a ruined one. In fact, what was once an important and lucrative and real industry, is now little more than a haphazard traffic in fruit, casually produced. Nice imports nearly all the good fruit exposed for sale in the market and shops. The cause of the decline is mainly attributable to the prevalence of insect and fungoid pests, and the lack of enterprise and organised effort to suppress them when it was possible to do so. It would scarcely be possible to suppress them now, but they might be kept in check, though only by united and organised effort. Just now, daily, *á la gare*, you will see train-loads of grapes, coming from far distant vineyards, being sold for Nice consumption. There are thousands of acres in the environs of Nice suitable to vine-growing (and which once upon a time grew vines), uncultivated.

The olive oil industry, once the most important of all local industries, is dying out. Why? Because disease and the *keiroun*, a fly closely related to the *halterophora*, attacked the trees—diminished the crops, and so opened up a way for the adulteration of locally-grown oil (the finest known), and the importation into Nice of inferior oils, to be exported from Nice as *Huile de Nice.*

They, the growers, did not attack the pests and diseases of the trees, but simply ceases to cultivate the olive, and so millions of pounds have been lost to Nice and the land-owners of the Alpes Maritimes.

Oranges and lemons even are imported by Nice for local consumption, while locally-grown oranges are shovelled into railway trucks and carried away to the North, to be sold in the big manufacturing towns at prices that the poorest can afford to pay. Indeed, it is a ruined industry here (though it ought not to be), and one cannot urge too strongly upon new communities avoidances of the method (absence of method rather) to which this decrepitude is due. *Floriculture*, and the *Jardin Potager*, are not in the same category yet, with "Horticulture" in the Alpes Maritimes; there is still life in those branches of rural industry, but the pity of it is that Horticulture and Viticulture, far more wealth-producing than flower or kitchen gardening, have been allowed to languish almost to their death.

H. Capitata or Ceratitis Capitata, are one and the same beast. *H. Hispanica* is a different fly of the same family *(Halterophoræ)*, smaller than, but of the same habit as the *H. Capitata*. The difference is merely entomological, and it is doubtful if they know which they have got (both, probably) in Western Australia, and it matters little from the fruit-grower's outlook.

BEE NOTES.

Mr. Sutton, late president of the Beekeepers' Association, and recently appointed adviser to the Agricultural Department, and Inspector appointed in the interest of beekeepers for the extermination of foul brood, visited Donnybrook on 24th November, and gave an interesting address on the management of bees. Although the secretary of the South-West A. and H. Society had sent out about 40 notices, only a very few persons attended. This is a matter for regret, as beekeeping, carefully attended to, is one of the most profitable industries a farmer can devote his time to, as was shown from the experience of the speaker, who gave the following hints to intending beekeepers:—Begin with one swarm and study the habits and learn to master that one. This is important, for, as the speaker pointed out, there is nothing will master you quicker than beekeeping unless you master it. Provide Italian bees if you can at the start; if not able to afford it, a black swarm obtained from the bush, with an Italian Queen, will be a good start. From September to February is the best time to commence beekeeping. Of course, the earlier the more profitable. As an example of the profits attached to the industry, the speaker mentioned a gentleman in Claremont who purchased one swarm. The first season he built up five swarms; next year, finding he was getting too many, he sold

twelve swarms for £30, beside a large quantity of honey. Mr. Sutton stated that from a test hive in a very good season he had obtained 60lbs. of honey per week for five weeks. The work connected with the occupation, when once nerve has been acquired, is very interesting. For instance, one queen has been known to lay as many as 3,000 eggs in 24 hours. These become perfect bees in 21 days. Unless room is provided bees must then "swarm" to find a fresh home. Eggs may develop into queens in 16 days, the difference being in the food provided the larvæ. When the queen is young the number of worker eggs exceed drone eggs. Later the numbers are reversed. Also when the honey flow is good drones have free access to stores. When, however, supply begins to fail the drones are driven to one side or one corner; should supply again be provided, the drones are allowed to return; when supply fails entirely, they are again driven aside and allowed to starve. This is the time to provide food in the shape of syrup and sugar. It is never advisable to go amongst bees in cool weather, or mornings or evenings. Be careful to observe cleanliness. Nothing raises the ire of bees quicker than the smell of perspiration or dirt. It is sometimes necessary to obtain a supply of extra queens. To do this, the queen is extracted, when the bees will endeavour to raise other queens by supplying, as above stated, Royal food. As many then as four dozen may be raised. At the expiration of fourteen days the embryo queens are distributed where required. If this be not done, the first queen hatched will collect a few adherents and "swarm"; second and following likewise, when the whole may be lost. During this time bees must be fed. Many other items of interest were explained, amongst which was the best method to collect a swarm from the bush; and also boxes and books. A vote of thanks to Mr. Sutton concluded a pleasant evening.—*Bunbury Herald.*

CHERRY CROPS.

Inspector Lankester, in his report to the Chief Inspector, says:—"You may be interested to know that cherries this season are bearing fairly well in Mr. T. Ilberry's orchard at Wooroloo. I saw eight trees of white-heart cherries, about eight years old, with a medium crop of fruit of good size and flavour. Last year these trees had only a few lbs. of good fruit."

The Chief Inspector adds the following item:—"In my recent trip from Bridgetown to Mt. Barker I saw a good many cherry trees, but only a small variety (called locally a "wild" cherry), was fruiting satisfactorily, with the single exception of some trees of the Twyford variety in the orchard at Millar's Estate, Mt. Barker, where I saw some trees quite laden with first class fruit."

GREEN BONE AS AN EGG FOOD.

Leading authorities agree that green bone is the best egg-producing food known. It is not an artificial stimulant like some preparations which force hens to lay for a time. On the contrary, it is food which contains every element necessary for the greatest number of healthy nutritious eggs. A powder which merely forces the hen to lay cannot add to quality, and it is merely a question of time when the fowl will break down under the drain on the vital forces. Many poultry keepers have killed fowls through ignorance of scientific feeding by this forcing process. They killed the goose that laid the golden egg because they did not understand the laws of production. What is wanted is a thorough knowledge of the food that makes the most eggs, for a healthy hen with a full supply of egg material must by nature's laws become a steady producer.

Green bones—that is, bones fresh from the butcher—cannot be surpassed as poultry food; they are easily procured, are much cheaper than meat, and contain a large proportion of the elements that enter into the composition of eggs than any other material, as they are more concentrated. Ground dry bones have long been on the market as poultry food, and they have served the purpose intended; but while the poultrymen and farmers were resorting to the use of dry bones, they also witnessed the waste of much better and far more valuable food every day, in the shape of more nutritious, more digestible, and more highly-relished fresh green bones, simply because there was no method known by which the tough green bones could be reduced to a condition to render them acceptable to poultry. But with the advent of the green bone cutter, all of this valuable material can now be made to form a portion of the food for poultry. The old-fashioned bone mill grinds the hard, dry, brittle bones, but it is unserviceable in reducing green fresh bones, as green bones cannot be ground; the modern bone cutter, therefore, has come to supply a long-felt want, and ought to be extensively taken advantage of. These appliances can be obtained from several firms in Perth, and repay their cost without the least difficulty.

What is the difference between the green fresh bones from the butcher and those that have become hard and dry? Though the comparison of a green bone with a dry bone, side by side, will show there is a difference, yet an explanation is not out of place here. The green bone contains the natural juices (the water being a solvent) and upon evaporation the bone becomes very light. By weighing a fresh bone and weighing it again when it is very dry, the difference will be found astonishingly great. The green bone contains meat, blood, gristle, oil, and mineral water in soluble condition. Upon exposure to the air not only does decomposition occur, but the chemical changes are such as to rearrange the

particles of the bone itself. All animal substances, upon decomposition, are finally converted into ammonia, which is volatile, while the evaporation of the water not only liberates all gaseous formations, but permits of chemical changes which convert much of the soluble material into that which is insoluble. The green bone, though tough, is soft compared with the dry hard bone. Insects also clear away from the bones all that is unaffected by exposure to the air, and in place of the juicy, succulent green bone, rich in the phosphates, nitrogen, and carbon, we have the hard, dry, insoluble bone, brittle and bleached, and composed of but little more than phosphate of earthy matter, all of its real nutritious matter having passed away. The natural solvent cannot be regained or replaced.

The value of all foods depends upon their digestibility. The green bone, containing its natural juices, is digestible, especially by birds, and when in a very fine condition it is also digested by animals, because its particles are less dense; but the dry bone, having lost its solvent agent, has become harder, its particles rearranging closer together, and is only slowly digestible, if at all. Bear in mind that it is not the amount of food eaten that gives the best results, but the amount digested. Nothing will make a chick grow as rapidly as will green bone—in fact, the growth seems marvellous. The object of this is to impress upon all who keep poultry the necessity and importance of utilising the waste materials. Eggs are always cash in the market, and especially in winter, while bones are more plentiful in winter than are some other valuable materials. The bone cutters are labour-saving; they permit the use of valuable bone, and they pay back their cost in a short time, so that their use just now is almost a necessity.

The fresh bone serves a special purpose, for it contains the materials for the white of the egg, the yoke, and the shell all in a concentrated form, and in a partially soluble condition; while the dry bones will remain untouched—that is, as long as fresh bone is supplied. The cheapness of bones is another factor to be considered, as they can be purchased very cheaply from the butchers, and the improved bone cutters will render them valuable and convert them into the most desirable of all foods in a very short time.—*Exchange*.

DEVON BULLS.

Mr. H. C. R. Bunbury, Williambury, Carnarvon, writes to say that he has five imported Devon bulls that he is willing to dispose of, and will give any information in regard to them on application.

WESTERN AUSTRALIAN BEE-KEEPERS' ASSOCIATION.

The annual general meeting of this association was held in the Museum of the Department of Agriculture, Perth, Tuesday, 4th November, 1902. There were present Messrs. J. B. Kline (in the chair), C. Smith, R. Taylor, W. O. Hipewell, W. K. Potter, and the hon. secretary, J. Sutton.

The minutes of the previous meeting were read and confirmed.

The financial statement for the past year, which was read and received, showed a credit balance, and was considered satisfactory.

Correspondence was read *re* export of honey to England, but owing to the sparse attendance of members discussion on the subject was held over. Communications were also read with regard to foul-brood, which was reported to be very prevalent in and around Perth, but which is now, happily, on the decrease. Correspondence was also read which had passed between the Department of Agriculture and Mr. J. Sutton with regard to the appointment of an inspector under the Foul-brood Act. Mr. Sutton was finally appointed to act as consulting inspector to the Department of Agriculture. The appointment was endorsed by the Beekeepers' Association.

The election of officers for the year ending June, 1903, in accordance with rule 6, was then proceeded with, and resulted as follows:—President, Mr. J. Shipton; vice-presidents, Messrs. A. H. Smith, A. Cook, and J. B. Kline; hon. secretary and treasurer, W. K. Potter, jun., Claremont; committee: Messrs. R. Taylor, C. Smith, J. Sutton, R. Wolfe, W. O. Hipewell, W. Masterton, and W. K. Potter. A resolution was passed that the committee communicate with the Royal Agricultural Society with reference to suitable space being set apart on their new grounds, so that all exhibits relating to agriculture may be shown together, with a view of creating more interest in this industry. It was also considered necessary that some alterations should be made with regard to the entrance fees and prizes, which were considered to be out of proportion, and thereby caused a lack of interest amongst producers.

The secretary was instructed to call a meeting of the committee early in December to discuss the various motions passed by the annual general meeting.

No further business being brought forward, a vote of thanks was passed to the retiring officers for their services during the past year.

Messrs. Kline and Sutton replied on behalf of themselves and other officers.

SEPARATE CHICKS.

In raising chicks, the sexes should invariably be separated as soon as their sex can be distinguished. The young cockrels need more food than the pullets, and get it. They are absolutely destitute of chivalry. That comes later in life. They trample the pullets out of the way, and take the choice morsels. Of course, if a surplus of food is supplied, the pullets will get all they need at the second table; but that is not a good thing to do. It is as bad for chicks as for children to have them leave food on the plates. Everything should be eaten up clean. In time, of course, cockerels are separated from yarded pullets, but as a rule the separation is too long deferred. The mission of the cockerel is to get his head to the block at the earliest day possible, and be fat when he gets there. This is best accomplished by an early separation from the pullets. If any one doubts that young cockerels eat more than pullets let him select separate pens of the same number and age and weigh the food for a week. The pressure of competition is beginning to do its work among farmers. The smartest are beginning to see that profit is attained only by the strictest attention to little things. Our poultrymen do not seem to be as bright as the housewives of Kansas and Missouri. Their poultry makes the transcontinental journey, and arrives here fat. Ours comes from nearby farms, and arrives here scrawny. Hence the better price for Eastern poultry. To make good poultry at a profit the chicks must have all they will eat clean from the day they are hatched. Separating the sexes will give both a better chance.

OILING HARNESS.

Take a common-sized sheet-iron tub and fill it two or three inches deep with oil, such as is commonly used for oiling mowers and binders, that will cost 20 to 40 cents per gallon and require about two or three gallons to a tub. Dip all parts of harness, bridle lines, and other leather so as to cover well in the oil, allowing time to get well saturated, say five to 10 minutes, after which hang up over the tub to drip, and when dripped off rub well all parts with any kind of a coarse cloth, and the harness will be as soft and pliable as a cloth. No fear of mice ever eating harness oiled with machine oil. If leather is very dirty, it should be washed and well dried before oiling. What oil is left can be jugged up and kept for another oiling. It will be seen that the cost is little compared with the benefit in the leather saving. The tub can be washed out, and be none the worse for oiling.

GARDEN NOTES FOR JANUARY.

By Percy G. Wicken.

The dry weather at this time of the year makes the vegetable garden look anything but at its best, and it is only by deep and constant cultivation that we are able to grow any crops at all. As we are continually pointing out in these articles, the only way to grow vegetables for a profit during this time of the year is to have the ground dug as deeply as possible and thoroughly well mixed with rotted stable manure. This, when well incorporated with the soil, helps it to retain the moisture, and enables the roots to penetrate deeply into the ground and to obtain moisture from the subsoil. In shallow-worked soil, where the roots are only on the surface, as soon as the surface soil becomes dry the plants must wither up. A surface mulching of straw, manure, bush rakings, winnowings from wheat, dead weeds, or any substance that will easily rot, will, if spread on the surface, help considerably to retain the moisture. This material may afterwards be dug into the soil for manure. All weeds should be cut down as soon as they appear, and the surface of the soil kept well stirred.

Those who have a plentiful supply of water will be able to keep up a supply of vegetables during the summer, and derive benefit and profit therefrom. All insect pests should be destroyed as soon as found, and not allowed to breed and get numerous before being dealt with.

French Beans.—This is about the best vegetable to grow during the hottest part of the year, and where there is sufficient moisture in the soil, a supply may be planted.

Madagascar Beans.—These should now be coming into bearing. The beans grow in clusters. They should be picked when young, cut into slices, and cooked the same way as French beans, the whole pod being used.

Lima Beans.—Early varieties should now be bearing. The beans are shelled and cooked the same as peas, and, with a little butter over them, are one of the most delicious vegetables to be obtained. The dried bean may also be used the same as haricot beans.

Cabbages and Cauliflowers.—Seed beds may be made so as to have plants ready for early planting; the land can also be broken up and prepared ready for sowing after the first rain.

Melons.—It is now too late for planting with any hope of success. It is a good plan to go round the bed when the melons are getting ripe and pick out the best and those true to name, and mark them with a knife so that they can be reserved for seed purposes for the following season.

Maize may be sown for green feed, but it is too late to sow for grain.

PUMPKINS.—Early varieties of pumpkins and squashes will now be ready for market. All sound ones should be stored away for future use; they will keep in a well-ventilated store. Keep a few large ones for seed purposes.

SORGHUM can be sown anywhere where there is sufficient moisture to allow the seed to grow, and will furnish a good supply of green feed. Care must be taken not to allow any stock to get at a growth of immature sorghum, or the result is likely to be fatal.

SWEET POTATOES will require hilling up, if not already done, and weeds must be kept down between the rows.

TOMATOES.—This fruit is now becoming plentiful in the market. More plants should be put out, if available, to keep up a supply. The plants will require shading. Should any black spot or other fungus disease appear, the fruit should be pulled off and burnt, so as to prevent the disease from spreading. If diseased fruit is allowed to rot on the ground, it is only a means of spreading the disease. Spraying with Bordeaux mixture is one of the first preventatives.

TURNIPS.—Towards the end of the month a number of early varieties of turnips may be planted, and if properly cultivated, should do well. Superphosphate is the best manure to apply to this crop.

Harvesting will be over by the time these notes appear, and most of the hay and grain will be stacked. Grass is now getting very dry, and the danger of bush fires is very great. Care should be taken to plough fire-breaks round all hay stacks and farm buildings; it is very little trouble, and in case of fire may save the stack. If any moist patches of ground are available, a quantity of cow pea may be sown. They will do well if the seed will germinate, and will yield a good supply of green fodder. As soon as the crop is taken off, the land should be fallowed, and then left idle until time for sowing the next crop.

The bot fly is again about, and it is well to call attention to this subject. When a horse is attacked by bots, the treatment is a subject for the veterinary surgeon. Prevention is better than cure. and a few notes on the life history of the bot fly may be of interest,

The fly lays the eggs on the hairs of the animal, which are licked off and carried into the mouth; thence into the stomach; thence they also work their way through the tissue to a point immediately beneath the skin, where they form a marble or lump from which the fly makes its escape through the skin, leaving behind an ulcerated fester.

The eggs, when laid on the hairs of the animal, can be easily detected, being generally on the jaws and shoulders, and they can be removed by thoroughly grooming the horse, and also by being rubbed with carbolised oil or washed with carbolic soap, or rubbed with other oily substance that will not hurt the skin.

THE CLIMATE OF WESTERN AUSTRALIA DURING NOVEMBER, 1902.

Atmospheric pressure has been slightly above the average throughout the State, and temperature has been below, except along the South coast, where it was about normal. The effect of propinquity to the coast upon the daily maximum is, as usual, very marked. Thus the mean at Rottnest was 70·2, Fremantle 71·8, Perth Observatory 74·7, Perth Gardens 78 0, Guildford 79·9, Northam 83·7, and Southern Cross 86·4. At night the effect is reversed. The mean of the minimum readings at Rottnest was 57·7, Fremantle 57·4, Perth Observatory 55·3, Perth Gardens 55·7, Guildford 52·8, Northam 52·7, and York 51·0. After this it commences to increase thus: Southern Cross 54·7, Coolgardie 56·1, and Kalgoorlie 57·3.

The hottest part of the State during the month was at Marble Bar, where the mean maximum was 103·0, and the highest temperature recorded 112 0 The "century" was reached at some time during the month at every station from York northwards, except at Geraldton, and it was also reached at Balladonia and Eyre, in the extreme South-East.

There were several fairly warm days in Perth, but the thermometer at the Observatory only just reached 90·4 once. The highest temperature in the sun at Perth was 156·4. The coldest part of the State at night time was between Wandering and Bridgetown, which places are included within the isotherm of 45*a* The lowest average temperature in the day time was at Breaksea Island, where the mean of the maximum readings was only 66·0. The difference between this place and Katanning is striking, Katanning showing an increase of 12*a*·7 in the day time and a decrease of 74 1 at night. It is rather interesting to notice that the mean of the night temperature at Perth, Breaksea, and Esperance were almost identical.

The rainfall was very light and below the average throughout the State, except in a few places in the tropics and between the Coolgardie Goldfields and the South coast, where scattered thunderstorms brought up the totals. At Perth the total from January 1 to November 30 has been 26·26 inches (at the Botanical Gardens), or 6·22 below the average for previous years.

The Climate of Western Australia during November, 1902.

Locality.	Barometer (corrected and reduced to sea level). Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Shade Temperatures. November, 1902. Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	* Average for previous Years. Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Rainfall. Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:															
Wyndham ...	29·893	29·830	30·086	29·769	96·0	80·5	88·2	102·0	69·0	100·7	80·6	113·5	69·2	400	2568
Derby	29·896	29·860	30·053	29·778	96·8	75·8	86·3	106·5	67·8	98·5	77·2	112·5	68·0	69	1586
Broome ...	29·902	29·862	30·044	29·757	93·3	74·8	84·0	109·2	68·0	93·6	75·9	111·0	65·0	9	2236
Condon ...	29·912	29·860	30·031	29·800	95·0	68·3	81·6	105·8	59·0	96·3	69·2	111·8	59·0	Nil	2074
Cossack ...	29·905	29·856	30·029	29·770	96·8	69·5	83·2	111·7	62·7	95·7	72·5	110·5	61·0	9	1306
Onslow ...	29·940	29·912	30·090	29·800	90·0	66·0	78·0	110·0	61·0	94·0	63·9	118·0	49·0	Nil	441
Carnarvon ...	29·994	29·938	30·165	29·837	82·8	63·7	73·2	103·0	55·3	83·6	64·4	112·0	50·0	9	909
Hamelin Pool...	29·984	29·939	30·151	29·784	88·8	60·0	74·4	103·4	52·0	90·4	60·0	109·0	46·6	Nil	691
Geraldton ...	30·054	30·001	30·212	29·861	77·9	88·5	68·2	96·5	49·0	77·7	58·7	105·0	45·0	3	1419
INLAND:															
Hall's Creek ...	29·926	...	30·042	29·824	98·4	74·5	86·4	104·9	61·5	...	...	...	...	140	1552
Marble Bar ...	...	...	...	...	103·0	73·0	88·0	112·0	63·0	...	...	...	...	23	1225
Nullagine ...	29·866	29·828	30·066	29·726	99·3	67·6	83·4	108·0	57·0	102·4	71·2	111·8	52·0	313	1515
Peak Hill ...	29·915	29·856	30·160	29·720	92·0	65·0	78·5	102·0	58·0	95·4	68·3	106·5	52·3	26	1898
Wiluna ...	29·923	...	30·200	29·757	90·9	61·7	76·3	105·2	52·6	...	...	...	...	16	1357
Cue	29·965	29·894	30·190	29·740	91·5	62·0	76·8	102·0	51·5	94·2	63·2	108·2	48·9	Nil	894
Yalgoo ...	29·955	29·918	30·180	29·730	89·0	59·0	74·0	103·0	51·0	91·9	59·7	107·7	47·0	Nil	610
Lawlers ...	29·936	29·860	30·190	29·705	83·0	61·6	75·2	105·4	52·0	92·0	64·4	105·2	45·5	5	1169
Laverton ...	29·930	...	30·334	29·688	89·1	60·6	74·0	103·3	49·8	...	...	...	...	4	1180
Menzies ...	29·976	29·916	30·327	29·697	86·6	59·4	73·0	106·2	49·0	89·7	61·6	105·0	47·0	23	1119
Kalgoorlie ...	30·009	29·940	30·356	29·678	84·4	57·3	70·8	107·0	48·0	88·0	59·0	104·8	47·2	104	1187
Coolgardie ...	29·995	29·944	30·400	29·730	83·5	56·1	69·8	106·2	46·2	87·9	58·0	105·7	47·3	97	1453
Southern Cross	29·990	29·937	30·283	29·780	86·4	54·7	70·6	106·3	44·8	88·6	55·4	108·5	42·0	45	1004
Walebing ...	...	...	...	...	82·5	52·2	67·4	107·0	41·0	...	...	...	...	3	1132
Northam ...	...	...	...	...	83·7	52·7	68·2	102·0	40·0	...	...	...	...	Nil	935
York	30·045	29·988	30·340	29·720	84·0	51·0	67·5	102·0	40·0	82·2	55·8	105·0	37·0	3	1069
Guildford ...	...	...	...	...	79·9	52·8	66·4	95·8	43·8	...	...	...	...	10	2377

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Climate of Western Australia during November, 1902—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					November, 1902.					* Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	*Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast :															
Perth Gardens	30·082	30 024	30·330	29·756	78·0	55·7	66·8	93·0	48·0	79·4	57·1	105·0	41·0	9	2626
Perth Observatory	30·083	30·026	30·325	29·756	74·7	55·3	65·0	90·1	47·8	74·7	56·3	100·9	45·7	11	2684
Fremantle ...	30·102	30·012	30·380	29·800	71·8	57·4	64·6	88·2	49·5	74·0	57·6	100·0	44·0	5	2436
Rottnest ...	30·078	29·987	30·333	29·766	70·2	57·7	64·0	85·0	51·2	73·3	56·9	92·8	42·0	2	2196
Mandurah ...	...	...	...	...	76·3	51·7	64·0	90·0	41·8	...	...	...	...	17	2566
Wandering ...	...	...	...	...	77·7	43·8	60·8	95·0	35·8	...	...	...	...	8	1769
Collie	...	...	...	...	76·1	45·8	61·0	92·3	39·2	...	...	...	...	40	2732
Donnybrook ...	...	...	...	...	75·5	47·7	61·6	90·8	37·9	...	...	...	...	45	2827
Bunbury ...	30·095	30·034	30·320	29·870	71·0	49·0	60·0	86·0	42·0	73·8	54·0	96·0	39·0	48	2479
Busselton ...	...	...	...	...	73·3	47·7	60·5	87·0	40·0	...	...	...	...	43	2426
Bridgetown ...	...	...	...	...	75·3	44·7	60·0	91·7	35·9	...	...	...	...	45	2953
Karridale ...	30·085	30·038	30·400	29·830	70·0	50·0	60·0	87·0	39·0	69·9	52·4	91·5	38·0	39	4419
Cape Leeuwin	30·075	30·002	30·400	29·730	68·0	57·0	62·5	81·0	51·0	67·9	57·6	84·0	39·0	59	3144
Katanning ...	30·070	29·988	30·370	29·730	78·7	47·9	63·3	96·5	38·0	79·1	59·6	106·0	36·0	34	1415
Albany ...	30·100	30·056	30·430	29·730	68·6	52·4	60·5	94·0	42·5	67·1	54·2	93·0	40·6	140	406
Breaksea ...	30·095	30·016	30·460	29·720	66·0	55·0	60·5	88·0	51·0	65·7	55·0	88·0	43·2	84	2688
Esperance ...	30·070	30·036	30·370	29·790	73·0	55·5	64·0	96·0	44·0	73·3	54·7	112·0	39·2	122	2406
Balladonia ...	30·021	...	30·273	29·685	78·7	51·3	65·0	106·6	41·0	...	...	...	...	172	1507
Eyre	30·056	30·010	...	...	74·3	56·1	65·2	108·2	42·0	74·0	54·3	106·5	34·5	199	1591

* The figures for previous years have been given whenever there are at least three years' complete records. This number is a very low one upon which to base averages, but otherwise the Goldfields would be excluded.

The Observatory, Perth,
10th December, 1902.

W. E. COOKE,
Government Astronomer.

RAINFALL for October, 1902 (completed as far as possible), and for November, 1902 (principally from Telegraphic Reports).

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:				
Wyndham ...	1	1	400	8
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	43	2	216	9
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	32	4	140	8
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	36	...	69	...
WEST KIMBERLEY:				
Obagama ...	...	...	...	...
Beagle Bay ...	Nil	...	...	...
Derby	Nil	...	69	2
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	Nil	...	73	4
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	Nil	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	9	1
Roebuck Downs	...	...	...	...
Thangoo... ...	Nil	...	...	...
La Grange Bay...	5	1	58	1
NORTH-WEST:				
Wallal	Nil	...	74	2
Condon	Nil	...	Nil	...
De Grey River ...	Nil	...	...	...
Port Hedland ...	Nil	...	Nil	...
Boodarie ...	Nil	...	...	...
Yule River ...	...	...	...	...
Warralong ...	Nil	...	...	...
Muccan	Nil	...	...	...
Ettrick	Nil	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	Nil	...	...	...
Pilbarra	Nil	...	Nil	...

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
NORTH-WEST—*cont.*				
Coongon	...	...	...	...
Warrawagine ...	Nil	...	...	...
Bamboo Creek ...	Nil	...	114	2
Marble Bar ...	Nil	...	23	2
Warrawoona ...	Nil	...	29	2
Corunna Downs...	Nil	...	...	...
Nullagine ...	Nil	...	313	4
Yandicoogina ...	...	...	...	...
Kerdiadary ...	Nil	...	...	...
Roy Hill... ...	Nil	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	Nil	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	Nil	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	Nil	...	Nil	...
Cooyapooya ...	...	...	...	...
Woodbrooke ...	...	...	...	...
Croydon	Nil	...	...	...
Balla Balla ...	Nil	...	9	1
Roebourne ...	Nil	...	Nil	...
Cossack	Nil	...	9	2
Fortescue ...	Nil	...	Nil	...
Mardie	Nil	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	Nil	...	...	...
Onslow	Nil	...	Nil	...
Peedamullah ...	Nil	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	Nil	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	...	...	...	...
Point Cloates ...	...	...	...	...
GASCOYNE:				
Winning Pool ...	Nil	...	16	2
Towara	...	...	...	...
Ullawarra ...	Nil	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	Nil	...	...	...
Bangemall ...	...	...	...	...

RAINFALL—*continued.*

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
Gascoyne—*contd.*				
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	Nil	...	...	...
Yanyeareddy ...	Nil	...	...	...
Williambury ...	Nil	...	...	...
Wandagee ...	Nil	...	...	...
Bernier Island ...	6	2	...	...
Boolathana ...	...	...	...	...
Carnarvon ...	2	1	9	1
Cooralya	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	Nil	...	...	...
Clifton Downs ...	Nil	...	...	...
Dairy Creek ...	1	1	...	...
Errivilla	Nil	...	...	...
Dirk Hartog Island	19	5	...	...
Sharks Bay ...	4	1	Nil	...
Kararang ...	2	1	...	...
Meedo	...	...	...	...
Tamala	...	...	...	...
Wooramel ...	Nil	...	3	1
Hamelin Pool ...	2	1	Nil	...
Byro	2	1	20	1
Yarra Yarra ...	2	1	...	...
Berringarra ...	Nil	...	21	1
Mt. Gould ...	Nil	...	...	...
Moorarie	...	...	...	...
Wandary	Nil	...	Nil	...
Peak Hill ...	Nil	...	26	2
Horseshoe ...	Nil	...	7	2
Mt. Fraser ...	Nil	...	8	2
Abbotts	Nil	...	Nil	...
Meekatharra ...	...	...	Nil	...
Belele	...	...	...	...
Mileura	6	1	...	...
Milly Milly ..	...	...	...	...
Manfred ...	9	1	2	1
New Forrest ...	...	...	Nil	...
Woogorong ...	8	2	...	...
Boolardy	Nil	...	...	...
Billabalong ...	...	...	...	...
Wooleane ...	11	3	Nil	...
Murgoo	...	...	Nil	...
Meeka	11	2	Nil	...
Mt. Wittenoom ...	15	2	Nil	...
Nannine	10	1	13	2
Star of the East ...	9	1	14	2
Annean	17	1	Nil	...
Tuckanarra ...	2	1	20	1

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
Gascoyne—*contd.*				
Coodardy ...	Nil	...	...	...
Cue	10	3	Nil	...
Day Dawn ...	9	1	Nil	...
Lake Austin ...	13	1	Nil	...
Lennonville ...	5	1	Nil	...
Mt. Magnet ...	Nil	...	Nil	...
Wurracoothara ...	Nil	...	3	2
Challa	...	...	...	...
Youeragabbie ...	Nil	...	Nil	...
Murrum	Nil	...	Nil	...
Burnerbinmah ...	14	2	...	...
Yalgoo	12	1	Nil	...
Gabyon	...	...	Nil	...
Wurarga ...	6	1	...	...
Gullewa	15	2	Nil	...
South-West Division (Northern Part):				
Murchison House	35	4	...	...
Mt. View ...	54	2	Nil	...
Mumby	121	8	5	2
Yuin	...	...	...	...
Northampton ...	156	5	Nil	...
Mt. Erin ...	65	5	Nil	...
Oakabella ...	...	...	...	...
Narra Tarra ...	...	...	...	...
Tibradden ...	59	6	...	...
Sand Springs ...	...	...	...	...
Mullewa... ...	10	3	Nil	...
Kockatea ...	15	3	Nil	...
Bootenal ...	...	...	...	...
Geraldton ...	41	9	3	3
Greenough ...	50	2	Nil	...
Dongara ...	75	4	Nil	...
Dongara (Pearse)	70	7	Nil	...
Strawberry ...	...	...	...	...
Mingenew ...	24	7	4	3
Mangah ...	28	3	...	...
Rothesay ...	36	3	...	...
Field's Find ...	...	...	...	...
Carnamah ...	16	3	Nil	...
Watheroo ...	18	3	Nil	...
Dandaragan ...	59	3	Nil	...
Moora	35	3	3	1
Yatheroo ...	109	5	...	...
Walebing ...	39	8	3	1
New Norcia ...	40	6	4	1

RAINFALL—*continued.*

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	73	8	7	1
Belvoir	223	6	Nil	...
Mundaring ...	187	9	34	3
Guildford ...	191	11	10	2
Kalbyamba ...	170	11	17	4
Canning W't'r'w'ks	236	11	18	3
Perth Gardens ...	147	11	9	3
Perth Observatory	122	13	11	3
Subiaco	128	12	5	3
Claremont ...	117	7	5	2
Fremantle ...	90	11	5	2
Rottnest	65	8	2	2
Armadale ...	204	11	27	5
Rockingham ...	179	8	14	2
Canning River ...	294	10	...	...
Jarrahdale ...	305	10	10	1
Mandurah ...	83	9	17	2
Pinjarra	168	8	23	5
Yarloop	159	11	41	5
Harvey	136	9	50	5
South-West, Central Part (Inland):				
Hatherley ...	59	5	...	...
Momberkine ...	89	5	4	1
Mouglin ...	47	3	5	2
Newcastle ...	92	6	2	1
Eumalga ...	94	6	2	1
Northam ...	39	3	Nil	...
Grass Valley ...	46	4	Nil	...
Meckering ...	99	8	Nil	...
Cunderdin ...	113	5	...	...
Codgen	42	5	Nil	...
Jarragin	82	7	Nil	...
Doongin	110	3	...	...
Cuttening ...	99	9	Nil	...
Whitehaven ...	83	2	...	...
Sunset Hills ...	101	8	6	2
Cobham	56	5	3	2
York	79	7	3	1
Beverley ...	135	6	Nil	...
Stock Hill ...	147	5	5	2
Sunning Hill ...	145	5	...	...
Wandering ...	175	7	8	1
South-West—*contd.*				
Pingelly ...	143	6	Nil	...
Marradong ...	151	7	13	1
Bannister ...	174	10	13	3
Narrogin ...	224	8	23	3
Wickepin ...	133	4	7	1
Gillimaning ...	109	5	11	2
Bunking ...	184	8	4	2
Bullock Hills ...	134	7	24	2
South-West Division (Southern Part):				
Bunbury ...	119	11	48	4
Collie	193	13	40	5
Salvation Army Settlement	213	8	39	5
Glen Mervyn ...	180	11	58	4
Dardanup ...	161	7	69	5
Donnybrook ...	147	8	45	4
Boyanup ...	141	8	...	...
Ferndale ...	...	...	31	2
Busselton ...	143	16	43	9
Lower Blackwood	307	13	100	6
Karridale ...	345	21	39	9
Cape Leeuwin ...	215	23	59	13
Biddellia ...	335	15	1	8
The Warren ...	358	15	94	5
Lake Muir ...	259	17	...	...
Mordalup ...	229	16	51	10
Deeside	292	15	39	6
Riverside ...	187	12	78	9
Balbarup ...	251	17	71	8
Wilgarup ...	283	19	67	6
Mandalup ...	210	12	74	5
Bridgetown ...	260	17	45	8
Greenbushes ...	189	13	36	5
Greenfield ...	103	9	49	5
Glenorchy ...	189	10	...	...
Williams ...	68	6	11	3
Arthur	215	12	46	6
Darkan	211	7	...	...
Wagin	158	6	17	1
Glencoe ...	144	11	27	2
Dyliabing ...	124	10	19	2
Katanning ...	137	8	34	5
Kojonup ...	309	13	35	3
Broomehill ...	218	12	28	...
Sunnyside ...	182	12	44	5
Woodyarrup ...	160	13	29	2

RAINFALL—*continued.*

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
SOUTH-WEST—*contd.*				
Cranbrook ...	156	9	15	2
Blackwattle ...	191	11	29	3
Mt. Barker ...	266	12	49	5
Kendenup ...	282	13	23	2
St. Werburgh's...	241	15	53	7
Forest Hill ...	321	20	41	8
Denmark ...	284	9	40	2
Grasmere ...	372	9	63	8
Albany	283	14	140	10
Point King ...	299	13	108	6
Breaksea ...	241	17	84	11
Cape Riche ...	288	9	...	...
Pallinup ...	139	11	42	4
Bremer Bay ...	234	12	71	4
Jarramongup ...	...	...	...	...
EASTERN DIVISION:				
Lake Way ...	Nil	...	16	1
Mt. Sir Samuel ...	12	1	23	1
Lawlers	31	3	5	3
Leinster G.M. ...	18	1	13	2
Lake Darlôt ...	20	1	...	...
Mt. Leonora ...	6	2	11	1
Mt. Malcolm ...	Nil	...	9	1
Mt. Morgans ...	Nil	...	42	1
Burtville ...	28	1	145	5
Laverton ...	18	2	42	2
Murrin Murrin...	25	4	28	2
The Granites ...	11	1	33	2
Tampa	Nil	...	35	2
Kookynie ...	Nil	...	26	2
Niagara	9	...	37	...
Yerilla	55	3	13	1
Edjudina ...	9	2	67	3
Menzies	17	2	22	3
Mulline	16	2	72	3
Waverley ...	30	3	77	2
Goongarrie ...	6	2	38	2
Mulwarrie ...	40	4	88	4
Kurawa	33	3	370	2
Kurnalpi ...	147	5	108	4
Bulong	154	4	97	3
Kanowna ...	75	3	105	3
Kalgoorlie ...	165	4	104	3
Coolgardie ...	309	5	97	3

Stations.	October. No. of points. 100 = 1in.	October. No. of wet days.	November. No. of points. 100 = 1in.	November. No. of wet days.
EASTERN—*contd.*				
Burbanks P.O. ...	69	3	114	2
Burbanks Birthday Gift	75	5	111	3
Woolubar ...	125	6	67	3
Widgiemooltha...	334	7	100	3
50-Mile Tank ...	126	5	92	2
Waterdale ...	237	8	89	3
Norseman ...	318	6	63	2
Bulla Bulling ...	250	5	109	3
Woolgangie ...	149	5	114	3
Boorabbin ...	100	5	50	3
Karalee	59	3	27	2
Yellowdine ...	54	4	38	3
Southern Cross...	54	4	45	4
Mt. Jackson ...	55	4	29	2
Bodallin ...	65	3	119	3
Burracoppin ...	27	2	...	...
Kellerberrin ...	102	5	Nil	...
Mangowine ...	53	2	...	...
Wattoning ...	15	2	...	...
EUCLA DIVISION:				
Ravensthorpe ...	478	16	104	4
Coconarup ...	469	16	...	...
Hopetoun ...	330	16	104	7
Fanny's Cove ...	651	12	...	...
Park Farm ...	680	17	...	...
Esperance ...	574	17	122	9
Gibson's Soak ...	701	15	172	6
30-Mile Condenser	639	14	155	6
Swan Lagoon ...	572	20	...	...
Grass Patch ...	577	16	...	...
Myrup	561	18	149	5
Lynburn ...	...	...	...	...
Boyatup... ...	525	13	163	8
Point Malcolm ...	615	15	195	8
Israelite Bay ...	489	11	172	8
Bulbinia ...	...	...	...	...
Frazer Range ...	112	8	...	...
Balladonia ...	324	8	172	5
Southern Hills ...	240	9	129	4
Eyre	152	9	199	7
Madura ...	87	4	...	...
Mundrabillia ...	80	6	...	...
Eucla	114	4	102	7

The Observatory, Perth,
10th December, 1902.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during November, 1902.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of Apples.	Apricots.	Bananas.	Cherries.	Gooseberries.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomoloes.	Pines.	All other fruits.
Fremantle ...	5980	5279	701	701	931	...	1313	327	273	849	...	1350	...	...	2	...	...	...	234
Albany	304	286	18	18	107	...	19	54	35	7	...	43	...	5	...	16	...	...	...
Geraldton ...	26	26	...	...	...	...	2	...	...	...	...	...	...	...	...	...	24	...	...
Esperance ...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	6310	5591	719	719	1038	...	1334	381	308	856	...	1393	...	5	2	16	24	...	234

Department of Agriculture,
8th December, 1902.

Return of Fruit Trees and Plants imported into Western Australia during November, 1902.

Name of Port.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.																
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
Fremantle ...	3	400	3	400	...	..	...	400	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Albany ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...
Esperance ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	..	...
Total ...	3	400	3	400	...	...	...	400	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Department of Agriculture,
8th December, 1902.

By Authority: Wm. Alfred Watson, Government Printer, Perth.

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